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WORTHINGTON

Producers Continue Optimistic in Spite of Bad Situation Existing in Refined Oil Market

By ANDREW M. ROWLEY

DEVELOPMENTS during the next few weeks probably will indicate fairly clearly what the petroleum industry may expect during the remainder of this year. The situation at present, as for some time past, is clouded by uncertainty regarding several vitally important factors and progress towards stability will be handicapped until definite decisions are made and action taken to clear the atmosphere and settle questions at issue. The key to the situation still is looked upon as East Texas and much depends upon whether laws and regulations affecting production and shipments there are enforced. Action of the Department of Justice in placing restrictions on operation of the Pacific Coast cartel has resulted in chaos in the refined oil market there and considerable talk of the possibility of lower crude oil prices. The cartel would have eliminated the struggle for gallonage. The mad scramble for sales existing now has brought gasoline prices to the lowest point in years. It is hard to believe that Attorney General Cummings thinks this kind of competition is for the best interests of the people and the nation.

Willingness upon the part of refiners and marketers in the Mid-Continent area to sign the supplemental, modified marketing agreement leads the industry to expect the pooling and marketing agreements will be made effective soon. They are counted on to help greatly in stabilizing market and price conditions both for crude oil and gasoline. The administration's bill, clarifying many points of doubt in the petroleum code and strengthening the position of the Oil Administrator in the matter of limiting production of crude oil and refined products, has been prepared and will be introduced into Congress shortly. Its adherents expect it to be passed quickly. Some features of the proposed legislation may be objectionable to the industry but it looks as if the Federal government will wield an increasingly greater control over many phases of the oil business for a long time to come.

Despite the bad situation existing in the refined oil market, crude oil producers are optimistic and a better feeling exists throughout this branch of the industry than for years. Field work is increasing and personnel is being enlarged. The Binger well in Caddo County, Oklahoma, regarded as a commercial producer, undoubtedly will result in considerable exploration work throughout Western Oklahoma. The completion of a 20,000-barrel well in Kettleman Hills took the minds of oil men in California off the bad refined oil situation, temporarily at least. Gulf Coast operators continue busy and are hopeful of opening new producing areas. North Central Texas is enjoying what approaches a boom in drilling operations.

Crude Oil Production in the United States

Estimated daily average production for the week ending March 24, and a comparison with previous week and one year ago, follows:

	Mar. 24	Mar. 17	Mar. 25, 1933
Oklahoma—			
Oklahoma City	166,475	180,945	250,745
Seminole-St. Louis	104,135	108,090	112,810
Remainder of State	229,095	221,525	200,325
Total Oklahoma	499,705	510,560	563,880
East Texas—			
Lathrop	210,310	212,209	146,967
Kilgore	152,865	154,242	119,915
Joiner	136,375	137,609	128,832
Total East Texas	499,550	504,060	395,714
West Texas	132,615	128,455	161,062
North Central Texas	88,045	91,115	75,095
Texas Panhandle	57,810	52,742	55,157
East Central Texas	43,957	43,797	58,586
Gulf Coast—Texas	159,543	161,055	150,535
Southwest Texas	49,205	43,515	53,015
Total State of Texas	1,030,725	1,024,739	949,164
Kansas	124,520	124,315	122,740
North Louisiana	28,050	26,830	31,195
Gulf Coast—Louisiana	45,215	45,055	35,317
Arkansas	30,960	31,115	30,825
Eastern Fields	124,000	120,000	104,000
Rocky Mountain area	82,640	82,250	75,934
California—			
Santa Fe Springs	42,750	42,750	39,000
Long Beach	63,500	63,750	53,500
Playa Del Rey	9,100	9,100	10,000
Elwood	13,750	11,800	14,250
Kettleman Hills	66,750	57,250	60,500
Remainder of State	297,650	298,350	193,750
Total California	493,500	483,000	371,000
Total United States	2,459,315	2,447,864	2,284,055

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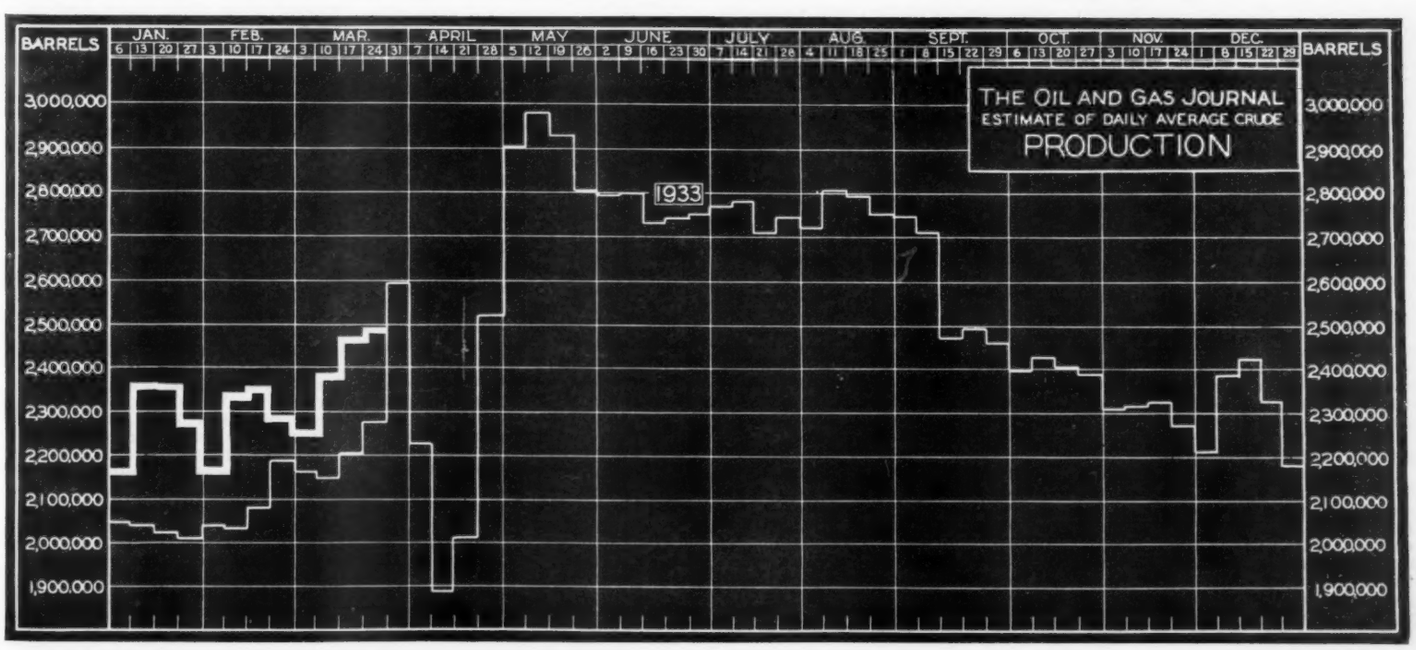

New Deep Test Started in Santa Fe Springs Field May Be Carried Approximately 9,000 Feet

By L. P. STOCKMAN
Staff Correspondent, California Fields

LOS ANGELES, Calif., Mar. 24.—General Petroleum Corp., subsidiary of Socony-Vacuum, has started work on what is destined to be a deep conclusive test in the Santa Fe Springs Field and this well will bear watching during the course of work. The company recently landed 1,008 feet of 18⅝-inch casing in No. 46 Santa Fe, and has resumed drilling operations. The importance of this well lies in the fact there is every reason to believe deep drilling may be productive of satisfactory results and precipitate another town lot drilling campaign. There have not been any real deep conclusive tests drilled on top of the Santa Fe Springs structure, although several deep wells have been drilled around the edge of the structure. One of these deep holes got some rather good looking showings a few years ago but due to the location failed to result in commercial production.

It is interesting to note that the bottom of the productive geologic column has not been reached at Santa Fe Springs as the bit was still in Miocene in the deepest test drilled up to the present. The possibility of discovering a new deep zone at Santa Fe Springs appears to be rather favorable although this will require rather deep drilling. The new deep zone is expected to be encountered at approximately 9,000 feet. Due to the extreme depth at which production is expected it is not likely operators will engage in any competitive deep drilling program for the simple reason these deep wells will prove rather costly especially if the hole is lost around the 9,000-foot level. At the same time, 9,000-foot holes can be drilled with more than a fair assurance of reaching the objective. A few years ago this would have been termed a hazardous undertaking but with the improved drilling equipment developed this does not involve any great risk.

Extreme Importance

While it cannot be said the Santa Fe deep test was prompted by the result of deep drilling in the Montebello Field, this work may possibly have had some bearing on it. The connection between these two deep tests lies in the possibility that Universal Consolidated may have added a new chapter to geological possibilities of Los Angeles Basin. No. 1 Cruz of Universal Consolidated in the Montebello Field is believed to have been bottomed in middle Puente of Miocene age and if subsequent developments confirm this it may become of great importance. The middle Puente has not heretofore produced oil in southern California, but if these rocks are commercially productive in the Montebello Field they should also be found productive in the Santa Fe Springs Field.

Due to the necessity of protecting upper horizons, deep drilling at Santa Fe Springs will necessarily be rather slow, so it may be several months before the bit reaches the bottom of present production. This well is very well located with respect to structure and consequently will prove to be a conclusive test.

Other Deep Tests

Deep drilling in the Santa Fe Springs Field revives the belief that similar deep work in Long Beach and other Los Angeles Basin fields may be similarly productive. So far as Long Beach Field is concerned, there has not been a real deep test drilled on top of the structure and consequently deep zone possibilities of this district are yet undetermined. The Shell drilled a deep test at Long Beach several years ago, but this well was not especially well located with respect to structure and consequently did not condemn the field for deep production. As a matter of fact, the Shell found some rather good looking showings in its deep test at Long Beach but could not make the sand produce in commercial quantities and accordingly suspended work.

Recently, Wilshire Oil Co. resumed drilling operations on No. 2 Potrero in the Potrero Field of Los Angeles Basin and it is the present intention to carry this well to the 10,000-foot level provided mechanical trouble does not interfere with work and that the geological possibilities warrant drilling. Playa Del Rey is out of the question so far as deep drilling is concerned as the basement complex has been reached at the bottom of the Recreation zone. The Rosecrans Field of Los Angeles Basin has possibilities and deep drilling will ultimately be undertaken in this district. A year or so ago Barnsdall started deep drilling on the Trust lease but did not carry the work to conclusion as the company did not desire to precipitate a drilling program. Sufficient showings were encountered on the Trust lease to justify the expectation that a deep test drilled on top of structure might be commercially productive.

Dominguez still has several untested horizons that should ultimately be found productive, but operators in this field are not interested in prosecuting competitive drilling. Inglewood is another field that will be heard from although acreage is closely held and drilling may be retarded. Potrero, Rosecrans, Dominguez and Inglewood are mentioned because if the Universal Consolidated or General Petroleum find the middle or lower Miocene productive in either Montebello or Santa Fe Springs these rocks should also be found productive in the other districts mentioned. West Coyote might also be classified in this group as this field has similar possibilities. Standard controls more than 99 per cent of the productive acreage in the West Coyote Field and has consequently retarded deep zone exploitation.

History Repeated

Deep drilling in the Santa Fe Springs Field is of special interest because this field was one of those that precipitated the chaotic condition that existed in 1923 as a result of simultaneous development of Huntington Beach, Long Beach and Santa Fe Springs. Huntington Beach caused considerable trouble during 1933 and if history is to repeat itself it now appears to be Santa Fe Springs' turn. Just previous to the initiation of tideland drilling at Huntington Beach, the Long Beach Field had another one of its periodic flings that caused state production to show a slight upswing. At the present time, a number of Long Beach operators are engaged in whipstocking or artificially deviating wells in such a manner that they end up under the Long Beach cemetery which until recently has been free from abnormal drainage as operators have not made any special effort to drill crooked holes. Some have of course deviated from the vertical but this was due to subsurface conditions and does not represent premeditated effort.

Up in the San Joaquin Basin, deep drilling is rapidly becoming of greater importance as time goes on. In the South Belridge Field, General Petroleum is still drilling at 10,605 feet, but has not yet encountered anything resembling commercial production. At Lost Hills, Associated, although it has found a number of stringers of oil sand, is still drilling. Out in the extreme western end of the North Dome, North Kettleman Oil & Gas Co. is completing financing arrangements whereby the company will be enabled to resume deep drilling on No. 1 Lillis-Welsh, which was suspended a few months ago at 10,944 feet due to mechanical troubles. This well, if the hole can be cleaned out, should open a new deep zone in the Kettleman North Dome Field as there was considerable oil in evidence when a premature explosion wrecked the hopes and ambitions of Ed McAdams just when everything looked to be in the bag.

Companies and Individuals in California Indicted in Oil Code Prosecution

LOS ANGELES, Calif., Mar. 26.—The Standard Oil Co. of California, Associated Oil Co., three alleged subsidiary companies and 41 individuals were named in indictments charging violations of the Federal petroleum code returned by the Federal grand jury. Of the three minor companies indicted, it was charged the Signal Oil & Gas Co., a Delaware corporation, and Signal Oil & Gas Co. of California are controlled by Standard of California, and Seaside Oil Co. by Associated.

The indictments charged the major companies produced gasoline which was distributed and sold through the minor firms with different trade names. The three grades of gasoline distributed by Standard and Associated, and in turn retailed by the minors, were said to be identical in each instance and to have been manufactured by the major organizations.

In the cases of first and second grades of gasoline, the indictments charge, the prices charged by the minor companies were identical with those charged by the majors, but on the third grade product, the minor companies were alleged to have "undersold" their ostensible competitors.

"For the purpose of secret price cutting on the lower grade gasoline," the indictments charged, both the Seaside and Signal companies operated in "ostensible competition" with the parent companies.

The indictment set out the Pacific Coast price of gasoline is generally fixed on the production in the Los Angeles oil basin, that there are over 4,000 retail gasoline stations in the Los Angeles metropolitan area, and that through alleged "rebranding" of the same gasoline, "the most vicious price-cutting war in oil history is now in effect."

Count for Each Day

By the alleged "device and subterfuge," smaller and independent oil producers and distributors are facing ruin, the indictments charged.

For each day's alleged violation of the oil code since last August 19, when it was signed, a separate count is listed in the indictment. A maximum fine of $500 for each defendant on each count is provided in the code. The possible fines for the Standard defendant is approximately $1,600,000 and in the Associated case $2,200,000, authorities said.

The Standard indictment, which contained 149 counts, charged that company controls the Signal companies by a series of contracts, and that all gasoline sold by Signal companies is Standard gas. The Associated company was said to control the Seaside company by stock ownership. The latter indictments contained 185 counts.

Kenneth R. Kingsbury, president of the Standard company; W. H. Berg, H. D. Collier, R. W. Hannah, Oscar Sutro, M. E. Lombardi, A. M. Tuttle, G. E. Kennedy, A. S. Russell, R. K. Davies and V. F. Palmer, all of Standard; H. M. Mosher, S. B. Mosher, O. W. March, H. H. Green, Norman Chandler, David R. Faries, Earl Huntley and H. J. March of the Signal companies were named as defendants.

The Associated defendants were W. F. Humphrey, L. F. Bayer, B. I. Graves, J. H. Jenkins, L. D. Jurs, E. L. Shea, W. A. Sloan, J. H. Edwards, Alden Anderson, F. H. Buck, Charles M. Cadman, J. A. Chanslor, John F. Forbes, H. P. Grimm, J. A. McCarthy and Paul Shoup. Seaside defendants were A. M. Hineman, J. F. Bushnell, John Doe Brent, C. F. Gilmore, D. E. LeComb and M. W. O'Brien.

In a statement, Oscar Lawler, counsel for Standard, said that company has "at all times observed the letter of the law in respect to fair competition and the NRA laws."

David R. Faries, member of the board of the Signal company and one of its counsel, said "Standard Oil never at any time owned a share of stock in Signal Oil. . . . True, we have had agreements for sale and purchase of products, but our productions were independent of one another.

"Our chief worry," said Mr. Faries, "has been over the prices charged by independents, which have been so low we feel government investigation in that connection would bear real fruit."

Shell and Richfield, Too

Late today the Federal Grand Jury returned two additional indictments charging violation of the code of fair competition, one being against the Shell Oil Co., the Guardian Oil Co., which, it was charged, is controlled by Shell, and 13 individuals, all officials or directors of Shell.

William C. McDuffie, receiver in equity for the Richfield Oil Co., in which capacity he was said to "own and control" the Rockett Oil Co., was named in the second indictment.

The Shell company, through "device and subterfuge," was charged with unlawful price cutting by selling its third-grade gasoline through the Guardian company under another name and at a lower rate.

Under similar circumstances, Mr. McDuffie, as Richfield receiver, was alleged to have sold Richfield's third-grade gasoline through the Rockett company.

The 13 officials and directors of Shell who were indicted for the alleged "aiding and abetting" in the "subterfuge" were: S. Felither, E. L. Miller, D. Higgle, E. F. Davis, John W. Stair, A. E. La Comble, A. R. Bradley, D. Tycel, Richard Airey. Samuel Trynl and R. G. A. van der Woude.

Petroleum Administration Bill, About Ready, Is Expected to Settle Many Present Questions

By HUGH D. MALLON
Washington Bureau, The Oil and Gas Journal

WASHINGTON, D. C., Mar. 27.—It is felt here the tension between Secretary of the Interior Harold L. Ickes and Attorney General Homer S. Cummings is increasing. The feeling between the two men has flared up again with the action by the Attorney General on the California cartel, and more recently by his having indictments returned against five oil companies and several individuals in California. Meanwhile the attorneys of the Petroleum Administrative Board have about completed their work on the bill which is being prepared under their guidance for submission to Congress. It is expected that it will be introduced in both houses within the week. It is known that scrupulous care is being devoted to the preparation for the appeal in the Supreme Court, which will be heard the forepart of April. The administrator has released several important announcements during the past week, one of which relates to the cancellation of consumers' discount contracts.

The indictment in California of 5 oil companies and 41 individuals connected with these companies caused quite a surprise to the officials charged with administering the provisions of the petroleum code. It is understood that Secretary Ickes, the oil administrator, recommended that the indictments not be returned, but this action was taken by the Department of Justice, nevertheless.

Apparently the oil administrator does not believe that the acts complained of are violations of the petroleum code. The defendants are charged with selling petroleum products at less than the posted prices through the alleged subterfuge of establishing affiliated companies which sell the products of the parent companies exclusively, but under another trade name, and at a lower price than the parent company is selling them. It is known that the Attorney General was familiar with the views of the oil administrator on this point and the reason for the subsequent indictment of these concerns is unknown to the administrator. From the recommendations to the Department of Justice by Mr. Ickes, and the statements of individuals connected with the administration of the oil code, the question of whether or not the code is violated by practices such as these has been debated, and the consensus of opinion seems to be that by no stretch of the imagination can it be said that these acts done in California constitute a criminal offense.

The indictments were returned against the Standard Oil Co. of California, the Associated Oil Co., the Signal Oil & Gas Co., the Signal Oil & Gas Co. of California, and the Seaside Oil Co., and 41 individuals.

California Situation Serious

Due to the failure of the Department of Justice to modify its stand on the Pacific Coast cartel a serious condition now exists on the Pacific Coast, particularly in California, which threatens to step over the bounds of being a sectional condition and assume the position of a national menace. A price war of alarming proportions is being waged on the coast which already has undermined the crude oil price structure there. The immediate fear now is that this condition will spread to other sections of the country, caused by the California refiners, in desperation, dumping their gasoline on the eastern markets through shipments to the East Coast by way of the Panama Canal. If this is done the entire national market faces a period of chaos which it is doubtful it can stand at the present time. Gasoline markets all over the country are weak and it would not require much to turn the tide definitely away from stabilization and recovery.

During the week progress was made with the marketing agreement. To meet the objections of certain marketers in the Midwest and the Southwest a supplementary agreement was entered into by the signatories of the agreement, and it is said that a large number of nonsigners have expressed a willingness to sign the agreement as amended. It is expected that it will now be possible to present the pooling and marketing agreements to Secretary Ickes for his approval very soon. The immediate operation of the National Petroleum Agency set up by the pooling agreement would combat the present situation in California and any similar conditions which might arise through the purchase of surplus gasoline.

Refinery Control Program

The refinery control program sponsored by a group of independent refiners and passed upon favorably by the Planning and Co-ordination Committee is being held in abeyance awaiting action on several counterproposals which the major companies think would be more feasible. Legality of the proposal of the independents has been questioned by the majors and it is freely admitted by the proponents of the plan that it is open to question on legal grounds, but they argue that it is no more so than several other measures connected with the petroleum code. The principal point of disagreement concerns the plan for the establishment of quotas in commerce for motor fuel, with a specific allocation to each refiner covered by certificates to be used on every shipment from the refinery. When the certificates for a given period have been used, the refiner would be obliged to withhold shipments until the certificates for the next period were issued to him, as no carrier could accept shipments without the certificates attached.

The major companies contend that overproduction can be worked out through inventory control. They are opposed to any control of refinery operations and feel that they should not be required to share their markets, which have been built up over a period of years through national advertising, with other refiners.

The probabilities are that while this internal quarrel is going on the bill which the Petroleum Administrative Board's attorneys have drafted will settle the question for the industry. It is believed that the bill will provide for control of both production and refinery operations.

Pipe Line Divorcement

Besides the refinery and production control provisions which it is understood are in the bill, there is a great likelihood of there being a section included divorcing pipe lines from oil companies. In the present period, with the Government going the limit to help the little fellow and the small operator this action is very significant. There is no surer way to eliminate the little fellow in the oil business than to divorce the pipe lines.

Labor has occupied a major portion of the stage in Washington this week, with a large share of the attention focused on the current dispute between automobile employers and the American Federation of Labor. Congressional committees have under consideration a number of bills affecting labor and industry. Hearings on the Wagner labor bill (S. 2926) outlawing company unions, continued all this week with proponents of the bill appearing before the Senate Committee on Labor. It is expected that this testimony will be concluded this week, and that opponents of the measure will then be heard. Informed circles here believe that the bill has a 50-50 chance of passing, depending somewhat upon the settlement of the automobile labor controversy. Hearings on the Connery 30-hour week bill (H. R. 8492) have been concluded and Mr. Connery is bending every effort to bring it to a vote. It is quite probable that the House will pass this bill, but there is every indication that it will die in the Senate.

The Labor Situation

In view of the foregoing it is particularly interesting to note the labor situation under the petroleum code. The Labor Subcommittee of the Planning and Co-ordination Committee and representatives of the Petroleum Labor Policy Board met here last week in an effort to reach an agreement on differentials for skilled workers. Representatives of the American Federation of Labor and members of the industry also attended these meetings.

Several plans were considered, but none has been definitely decided upon. It is expected that an agreement will be reached promptly, as it is known that the Petroleum Labor Policy Board feels that proper differentials should have been established before this, and there is a possibility that such differentials will be established through an order of the administrator if there is further delay. It is understood that a sliding scale will be established providing that an employe who worked 36 hours in 1929 will receive a certain percentage of his 1929 pay, probably 100 per cent. An employe who worked 48 hours in 1929 would receive about 80 per cent, and in cases where an employe worked in excess of 48 hours in 1929, he would receive in addition, 50 per cent of the pay he received for the time in excess of 48 hours in 1929.

These differentials when established will be retroactive to September 2, 1933.

The administrator announced on Saturday that he had disapproved a proposal submitted by the Planning and Co-ordination Committee that would have lowered minimum wage rates in filling stations and garages in 13 states. Rejection of the proposal was recommended by the Petroleum Labor Policy Board.

The committee recommended that the code's labor terms be modified to permit one common labor employe at each filling station, garage or other place selling oil products to be paid 80 per cent of the minimum weekly wage. The proposal would have applied to Virginia, North Carolina, South Carolina, Georgia,

(Continued on Page 16)

New Law for Supervision of Refineries Is Upheld by Texas District Judge

AUSTIN, Tex., Mar. 26.—The State won its first legal skirmish with East Texas refiners over validity of the new law authorizing supervision of refineries by the Railroad Commission, when District Judge J. D. Moore sustained a general demurrer to an application of George L. Culver of Gladewater, owner of two refineries in Upshur County, for an injunction, in which constitutionality of the statute was challenged. A temporary restraining order was dissolved.

Attorneys for Mr. Culver planned to pursue the litigation and obtained leave to amend their petition, which they said might permit trial of the case on its merits at a later date. Mr. Culver contended the act was unconstitutional on several grounds and that the order through which it was being enforced by the commission was invalid.

In argument to substantiate the general demurrer, Attorney General Allred asserted: "It is significant they have omitted any allegation of fact." He charged the petition contained only "a lot of legal conclusions." He urged Judge Moore "to interpret this law in the spirit and light of the new day" and asked the court "not to consider lightly the recent five-to-four liberal decisions of the U. S. Supreme Court."

Mr. Culver's petition included allegations the act was unconstitutional in that it violates the "search and seizure provisions of the state and Federal Constitutions, was an unwarranted delegation of legislative power to the commission, placed unreasonable burdens on refineries and invaded private property rights in that it would permit disclosure of trade secrets. He contended the order of the commission was invalid because it was issued in 1932, more than a year before the law was enacted, and applied only to the East Texas Field.

J. H. Hart, of Austin, one of Mr. Culver's counsel, asserted the provisions of the law prohibiting dissemination by the commission of information obtained from refineries, except to proper governmental agencies, "is just a bunch of words" and "a mere deception." He argued the provisions of the statute giving agents of the commission authority to inspect refinery records would permit "fishing expeditions" and enable the agents "to rummage through the books, records, accounts and correspondence of refineries, whether personal or not."

"This law can not stand if the bill of rights of our Constitution means anything in Texas," Ocie Speer of Austin, another of Mr. Culver's counsel, declared.

In defense of the validity of the order, which required refineries to make daily and monthly reports, Mr. Allred introduced a copy of an order of the commission of March 12, which readopted the 1932 order.

Position of Rumania in the World's Oil Industry Analyzed by Chairman of Rumanian Group

By C. OSICEANU*

The crude oil production of Rumania can be estimated for the whole year 1933 at 7,345,000 tons (the known output for the first 10 months being 6,085,500 tons, and taking an average of 20,000-21,000 tons per day for November and December). In 1933 the production remained nearly on the same level as that of 1932, which was 7,350,000 tons. (Ton=7 bbls.)

Beginning with 1920, Rumania's output has shown a steady increase, the production for 1932 being 10.4 per cent superior to that of 1931, and the latter one exceeding by 15.4 per cent the figure for 1930.

The maintenance of last year's production on the same level is due on the one hand to the restriction scheme imposed by the international agreement during the first five months, when oil production was fixed at 18,600 tons per day, and on the other hand to the prudence shown afterwards by the large companies who directed their exploitation works according to the international economic situation of the oil industry, thus maintaining the daily average production for the remaining seven months at about 20,000-21,000 tons.

Drilling

The drilling may be estimated at about 230,000 meters (203,230 meters having been drilled to the end of October, and adding about 30,000 meters for the last two months). This means an increase of about 20,000 meters as compared with 1932, due to the fact that the majority of the newly drilled wells were situated in fields where oil pools were at great depths. At Boldesti the deepest well was more than 2,500 meters deep. (Meter= 39.37 inches.)

On this occasion we would mention that during this year the exploitation zones of our principal fields—Gura Ocnitei, Boldesti and Harsa—have been expanded, and new regions have been valued for oil exploitation, among which Aricesti in the Prahova district, a region which up to the present was considered important only for gas exploitation. There are also wells being drilled on the state exploration perimeters which are isolated from those already in exploitation, in order to increase the reserve of known oil-bearing lands of the country.

Refineries

The activity of the refineries is evidenced by the treatment of a quantity of 6,088,079 tons of crude oil during the first 10 months of the year, or about 7,348,000 tons for the whole year (taking 630,000 tons each for the months of November and December) as compared with 7,010,216 tons of crude oil in 1932. This shows an increase of about 338,000 tons, or 5 per cent.

The products of first distillation will show a total of about 7,210,000 tons, as compared with 6,908,734 tons in 1932. The increase is of about 300,000 tons, or 5 per cent.

The commercialization of the petroleum products is divided in the proportion of 80 per cent for export and 20 per cent for the internal consumption. The quantity exported during the three first quarters of this year was 4,506,300 tons, as compared with 3,644,900 tons during the same period in 1932 and 5,166,257 tons for the whole year 1932. On the basis of the figures we possess up till now, the export figure for 1933 is 15 per cent superior to that for 1932.

As to the internal consumption, there is also an improvement to be recorded, this consumption showing an increase of 14.5 per cent for the three first quarters, and we trust that the figures for the whole year will show still further improvement. During the first three quarters the internal consumption was 941,408 tons, as compared with 820,882 tons.

On the whole, the activity of the oil industry in 1933, as compared with that of 1932, can be summarized as follows: Stationary production, or a production marking a slight increase; an increase of 10 per cent in the drilling; an increase of 5 per cent in the activity of the refineries, an increase of 15 per cent in the internal consumption and in the export (taking into account the decreasing of the stocks).

During the past five years Rumania's crude oil production has increased by 72 per cent, exports by 170 per cent, while internal consumption remained on the same level, with the exception of 1933, which showed an increase of 14.5 per cent as compared with the previous year.

Financial Results

In spite of all efforts in the marketing of our products during the year, the prices, although superior to those of the previous year, will not be quite remunerative. Due attention was given by the petroleum industry to the internal consumption, this being intensified. But the fiscal charges represented still an important impediment to all our efforts. Likewise, the railway rates constitute a second factor which burdens heavily the internal consumption. It is sufficient to say that the price for light benzine has fluctuated from lei 1,198 to lei 2,098 per ton, exclusive of the fiscal taxes (price loco refinery), and between lei 9,200 and 10,120, inclusive of the fiscal taxes. Therefore to 1 kilogram light benzine at an average price of lei 1.65 per kilogram loco refinery there is added a fiscal tax of lei 8. The consumption of kerosene in this country is 8½ kilograms per inhabitant per year, which is inferior to the average consumption of other countries importing kerosene from Rumania. In 1932 the state has collected from internal consumption only lei 2,341,159,000 representing fiscal taxes and transport charges, while the total value loco refinery of the relative products sold was only lei 677,435,000 (inclusive of the export taxes, taxes of transport, turnover, municipal taxes for export, equals 2 milliards, which makes, adding 2 milliards more for supplementary taxes and royalties, nearly 6 milliards). (Kilogram= 2.2 pounds; lei=.006 cent.)

Governed by World Market

As regards export, the financial results were governed by the conditions of the world market. But these prices have shown important decreases during the first six months of the year. Thus light benzine has had a decreasing tendency, dropping until the end of the first six months by about 50 per cent, as compared with the initial price of January, 1933, calculated f.o.b. Constanza. A sudden change, without too great an effect, took place during the last six months, when prices, going up, attained the initial level of the year, which, moreover, was low enough as compared with that of the preceding years. On the whole prices for petroleum products f.o.b. Constanza have remained superior to the f.o.b. Gulf parity.

The total value of the products exported during the first nine months of 1933 was lei 5,840,476,000 as compared with lei 4,586,290,000 for the same period of 1932. The percentage increase in value for the whole year will probably be about 15 per cent corresponding to a similar increase in the quantity exported.

It is a fact worth mentioning that we have maintained all our outlets for the selling of our products abroad, increasing for some of them the import quotas as compared with the previous year. Our products have also penetrated during the year into regions situated very far from us.

Technical Progress

Our petroleum industry has continued to maintain itself — by improving its working methods—on the level of the petroleum industry of the United States of America. These improvements have continued to contribute, as during the last two or three years—towards the amelioration of economic difficulties by reducing the cost price per meter drilled and per wagon extracted.

The single tubing has been applied with success in the most important fields for high depth. In increasing the drilling speed, utilizing material of a superior quality, introducing electrical coring for the identification of the strata, using electric power for rotary drilling and applying geophysical methods, we have succeeded in obtaining a further reduction of the cost per drilled meter and in reaching depths of 2,000 to 2,700 meters in two to three months, which formerly were considered, with the old methods, as impossible of attainment. (At Gura Ocnitei a well of a depth of 1,350 meters was drilled and put into production in 40 days.) The cost per meter drilled in 1933 can be considered as representing only 33 per cent of such cost in 1929.

Rail Rates and Taxes

What we, the petroleum industry, struggled for—which moreover must be the aim of all industries—was to arrive at a reduction of cost price; all our efforts were in this direction; speedy drilling, cheap extraction, precise studies, economy of material, etc. But nearly all our endeavors are in vain owing to the high railway rates and the fiscal charges. It is not only in our country, but also in all other countries, that the fiscal authorities lay hands just on those industries which are still able to hold their own. In this connection I said in a speech which I made as president at the general meeting of the Union of Chambers of Industry and Commerce, the following:

"The heavy fiscal charges as well as the high railway rates, which very often exceeded even the cost price of the goods, are preventing the cost of living from becoming cheaper, which is so badly needed today. It is for this reason that the producers, not only in our country, but also in other countries, in order to cope with these conditions, are obliged to compress the cost price by reducing the salaries and wages of the staff. But

(Continued on Page 118)

*Representative of Steaua and chairman of Rumanian group at the International Oil Conference, 1933.

Allowable Production, for April-May, Increased 83,400 Over March Total

WASHINGTON, D. C., Mar. 26.—Secretary Ickes, oil administrator, has set the national allowable crude oil production for April and May at 2,366,200 bbls. daily, an increase of 83,400 bbls. over the March allowable of 2,282,200 bbls. The allowable becomes effective at 7 a.m., April 1 (Standard time at the place of production). The increase was authorized to meet the usual increased seasonal demand brought on by the advent of spring.

Each of the 18 oil-producing states was allowed a larger production, the largest increase, 32,800 bbls., going to Texas, the largest producing area, and the second to Oklahoma, which was given an increase of 20,000 bbls. The daily increase in the other states follows:

Illinois, 500 bbls.; Indiana, 200 bbls.; New York, 400 bbls.; Kentucky, 700 bbls.; Ohio, 500 bbls.; Pennsylvania, 1,600 bbls.; West Virginia, 500 bbls.; Arkansas, 100 bbls.; California, 8,600 bbls.; Kansas, 9,800 bbls.; Louisiana, 600 bbls.; Michigan, 2,000 bbls.; New Mexico, 1,500 bbls.; Colorado, 500 bbls.; Montana, 300 bbls., and Wyoming 2,800 bbls.

The administrator's order follows:

The estimate of the required daily production of crude oil to balance consumer demand for petroleum products during April and May, 1934, has been found by the Department of the Interior to be 2,366,200 bbls., and the Department of the Interior, after a careful, scientific and impartial investigation, collection and evaluation of all available, pertinent data, has found as a fact that the daily net reasonable market demand for crude petroleum from the several petroleum-producing states during April and May, will be as follows:

State—	Daily average (bbls.)
Eastern states:	
Illinois	12,500
Indiana	2,200
Kentucky	12,800
New York	9,700
Ohio	12,500
Pennsylvania	38,200
West Virginia	11,700
Arkansas	32,300
California	462,500
Kansas	122,100
Louisiana	72,400
Michigan	31,300
New Mexico	45,800
Oklahoma	476,400
Texas	980,700
Rocky Mountain states:	
Colorado	3,000
Montana	7,700
Wyoming	32,400
Total	2,366,200

The foregoing amounts are hereby recommended to the above enumerated states and allocated as the operating schedules for said states during said period, effective as of 7 a.m., (Standard time at place of production) April 1, 1934.

There shall be no net withdrawals of crude oil from storage during April and May, 1934, except in special cases upon the recommendation of the Planning and Co-ordination Committee, and the approval of the petroleum administrator. The period from April 1, 1934, to May 31, 1934, inclusive, shall constitute the reckoning period for the determination of net withdrawals.

Excess production or withdrawals from storage of crude oil in any state during January, February, and March, 1934, shall be charged against the allowable of the state for April and May, 1934.

Many Mid-Continent Refiners Sign Supplemental Marketing Agreement, Hastening Enactment

CHICAGO, Mar. 26.—Numerous Mid-Continent refiners who had hitherto failed to sign the oil marketing agreement affixed their signatures to the document at a meeting at the Blackstone Hotel here March 22 after it was submitted to them in a form modified by a supplemental agreement. The supplemental agreement carried a number of reservations which various refiners felt were desirable before they were willing to become parties to the plan.

In addition to those signing the agreement, numerous others indicated their intention of signing it in the near future. Optimism was expressed among refiners who have led the movement for signatures that the modified marketing agreement before long would be approved and signed by 95 per cent of the Mid-Continent refiners, many of whom have been "hold-outs" previously.

The meeting was in charge of C. E. Arnott, chairman of the marketing committee of the Planning and Co-ordination Committee. He advocated unanimous approval of the revised pact, asserting that early and united action along this line might be necessary to avert a much more drastic type of control on the part of the Government. Officials of leading major companies active in this area also advocated support of the agreement.

The modifications include sections abrogating limitation on tank truck deliveries from refineries and terminals; providing against marginal guarantees to jobbers on motor fuel of below 60 octane for shipment into regional districts 3 and 4; allowing refiners to give carload marketers not more than one-quarter cent a gallon differential on motor fuel below the price to jobber, and others of minor significance. Provisions were included for cancellation.

Members of the refining and marketing subcommittees of the Planning and Co-ordination Committee will hold a meeting in Dallas, Tex., on Thursday, March 29, with East Texas refiners and marketers. Provisions of the supplemental agreement will be explained and, it is expected, additional signatories will be procured for the agreement.

While the necessary signatories, representing 85 per cent of crude runs to stills of last November, have been secured for the marketing agreement, the percentage in the Mid-Continent has been considered as low and it is desired a better representation be procured before the marketing and pooling agreements are submitted to Harold L. Ickes, oil administrator, for approval. It is believed these agreements will be submitted to the administrator within the near future and made effective by him.

Following is the supplemental agreement:

Supplemental Agreement

Made and entered into on the ....day of ....., 1934, among the signatory companies engaged in the petroleum industry in the United States, supplementing an agreement (for marketing) made between the same companies dated February 5, 1934;

For mutual and valuable considerations, and pursuant to Section 4(a) of Title 1 of the National Industrial Recovery Act, the parties hereto do now and hereby among themselves and each with each and all of the others make and enter into this supplemental agreement as a modification of, and as a supplement to the said agreement (for marketing) dated February 5, 1934, and agree as follows:

1. All the provisions of said agreement (for marketing) dated February 5, 1934, except as modified and supplemented by this supplemental agreement remain in full force and effect.

2. There shall be no limitation as to the size of truck deliveries of motor fuel from refineries and terminals.

3. Motor fuel of below 60 octane for shipment into regional districts numbers 3 and 4, or sold for resale in said regional districts, shall be sold without marginal guarantee to jobbers, distributors or wholesalers as defined in the interpretation to the code of fair competition for the petroleum industry.

4. Refiners selling motor fuel to carload marketers, for resale to distributors, jobbers and/or wholesalers, shall have the right to grant to carload marketers on such business not more than one-quarter cent (¼ cent) per gallon lower price than would be charged if sold by the refiner direct to the distributor, jobber and/or wholesaler. The carload marketer shall be required to resell the motor fuel to the distributor, jobber and/or wholesaler, subject to all the provisions of the marketing agreement, the same as if sale had been made by the refiner direct to the distributor, jobber and/or wholesaler. In case of a sale to a carload marketer at a lower price, as hereinbefore in this paragraph stated, there shall be no further discount allowed on such sale nor shall there be any brokerage or commission paid thereon.

5. This supplemental agreement shall not become effective until approved by the President of the United States or an officer, agent or agency duly authorized by him, and the President may withdraw such approval and terminate this agreement at any time upon finding that it is contrary to the public interest.

6. Since Title 1 of the National Industrial Recovery Act requires that certain provisions of Section 10(b) of said title shall be contained in each agreement approved, prescribed, or issued under said title, said section is here set forth in full and made a part as follows: "The President may from time to time cancel or modify any order, approval, license, rule or regulation issued under this title; and each agreement, code of fair competition, or license approved, prescribed, or issued under this title shall contain an express provision to that effect."

7. After the conditions stated in Sections 6 and 7 have been met and complied with, this supplemental agreement shall become effective on such date as may be fixed by the Planning and Coordination Committee and shall remain in force until June 18, 1935, unless prior to that date it is terminated by the President of the United States, or unless Title 1 of the National Industrial Recovery Act shall cease to be in effect to the extent of permitting agreements of this kind.

8. This supplemental agreement may be signed in counterparts, and all counterparts taken together shall constitute the complete agreement.

In witness whereof the parties sign.

Legal Background of Nathan R. Margold, Now Chairman of Petroleum Administrative Board

Nathan R. Margold, solicitor of the Department of the Interior and chairman of the Petroleum Administrative Board, holds a position of the utmost importance to every division of the petroleum industry at this time. Not only does Harold L. Ickes, Secretary of the Interior and oil administrator, depend to a large extent upon recommendations made to him by the Petroleum Administrative Board, but legal cases vitally affecting the petroleum industry have been placed in the hands of Mr. Margold and his associates for preparation and argument.

Since the code of fair competition for the oil industry became effective, Mr. Margold has devoted much of his time to the problems and questions involved in the administration of this, the country's second largest industry. This vast amount of work necessitated the building up of a staff of assistants and the Lemon Building, a small structure near the Interior Building in Washington, was taken over to house other members of the Petroleum Administrative Board and their assistants.

As there is a strong feeling throughout the petroleum industry that the Federal Government will continue to exert a large measure of control over the business even after the period of the NRA, especially in view of the fact the administration has a bill prepared which is expected to give the Government further powers and authority and that such a law will be effective until repealed, oil men are especially interested in Mr. Margold's background. The following is taken from "The Reclamation Era," a publication issued monthly by the Department of the Interior, Bureau of Reclamation, in Washington.

Mr. Margold, of New York, who was on March 23 appointed by Secretary Ickes to the office of solicitor of the Interior Department, was born on July 21, 1899. His early education was received in the elementary and high schools of New York City. He graduated from high school in June, 1916, and was awarded a Regents scholarship.

Mr. Margold entered the College of the City of New York in September, 1916, and received his A.B. degree in June, 1919. In September, 1920, he entered the Harvard Law School and received the degree of LL.B., cum laude, in June, 1923, at the age of 24. After graduation from law school Mr. Margold worked from August, 1923, to April, 1925, in the law office of Cook, Nathan & Lehman, of New York City. He severed his connection with this firm to accept an

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NATHAN R. MARGOLD

appointment as assistant U. S. attorney for the Southern District of New York. This appointment was without regard to political considerations. During this assignment Mr. Margold served under U. S. Attorneys Emory R. Buckner and Charles H. Tuttle until 1927, and during this period personally conducted many appeals in the Circuit Court of Appeals without the loss of any contested case in his charge.

From September, 1927, to June, 1928, he was an instructor of law at the Harvard Law School, and during the year also edited, jointly with Prof. Joseph H. Beale, the fifth edition of Beale's Cases on Criminal Law.

Upon his return to New York City in July, 1928, Mr. Margold was appointed a special counsel to the New York Transit Commission in the Interborough Rapid Transit fare litigation and related controversies. In that capacity he worked extensively on various phases of the litigation both in its legal and factual aspects. In the New York Appellate Division and Court of Appeals stages of the litigation he also served as "of counsel" to the City of New York, writing the portions of the city's brief dealing with the substantive or nonprocedural issues.

In March, 1930, he was retained by the Institute for Government Research as its legal adviser on Indian affairs, etc. Since July, 1928, he has also been engaged in general practice of law in New York City, predominantly in the capacity of consultant or special counsel. Thus, for example, he was retained by William D. Guthrie to assist him in Tremaine v. Ward, popularly known as the Budget Controversy between Governor Roosevelt and the New York Legislature. Similarly, in 1930, he was privately retained to write a memorandum concerning the constitutionality of certain proposed amendments to the New York Public Service Commission Law. He also was retained in an important litigation involving a claim of many millions against the estate of the founder of the Scripps-Howard chain of newspapers (Scripps v. Scripps, U. S. Circ. Ct. of App., 6th Circ.), to write the briefs and frame the arguments orally presented to the court by Chief Justice Hughes shortly before his elevation to the Supreme Bench.

Mr. Margold is an active member of the following bars: New York State, U. S. Supreme Court, U. S. Circuit Court of Appeals for the Second Circuit, U. S. District Court for the Southern District of New York, U. S. Customs Court, and U. S. Court of Customs and Patent Appeals. He is a member of the American Bar Association, Association of the Bar

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Central Reforming Unit Proposed as Solution of Pennsylvania Straightrun Gasoline Problem

By ROBERT C. CONINE

CORAOPOLIS, Pa., Mar. 26.—A committee of refinery technologists are here at the Waverly Oil Works plant with representatives of the M. W. Kellogg Co. in connection with a project which may develop into the first major effort to correct an unbalanced situation in the Pennsylvania Grade oil refining industry. An increase of 148 per cent over 1926 demand for the grade lubricating oils and the prospect of further increases has made a serious problem of moving the straightrun gasoline which has proved excessive as runs to stills were stepped up to keep within hailing distance of demand for neutrals and bright stocks. Further, the trend toward lower S.A.E. number motor oils has reacted unfavorably upon bright stock movement, but here the solution is nearer at hand.

Straightrun Pennsylvania Grade gasoline has an octane number of 48 or less, and for that reason there is considerable difficulty in marketing it. While it might be consistent to offer this material at a price in line with its lower antiknock rating and the absence of treating requirement, the refiners wish to avoid any sales efforts which would put them in the position of price cutters demoralizing market structures.

Fact-Finding Bodies Appointed

The committee inspecting the Waverly plant is one of two recently appointed as fact-finding bodies to determine the advisability of plans considered by the National Petroleum Association, and the Pennsylvania Grade Crude Oil Association, in an effort to convert straightrun gasoline from a drag upon the Pennsylvania Grade lubricating oil business into an asset. It has been decided definitely that the gasoline must be reformed, that straightrun gasoline is to be eliminated from the region set-up. The question now is merely how this is to be accomplished most efficiently from the standpoint of all the refiners.

Members of the committee here today are: McLean Houston, United Refining Co.; P. M. Robinson, Pennzoil Co.; Frank J. Philippbar, Kendall Refining Co.; E. E. Ebner, Quaker State Oil Refining Co.; Louis J. Calkins, Valvoline Oil Co.; Ben Heath, Freedom Oil Works; C. R. Wagner, Pure Oil Co.; A. D. David, Bradford-Penn Refining Corp., and George M. Kirkwood, Pennsylvania Refining Co.

This committee is studying the advantages which may accrue from the location of a central reforming station at Coraopolis, or elsewhere, to serve refiners as far north as Clarendon, Pa. The refiners would send their straightrun gasoline and gas oil by pipe line to the Coraopolis reforming plant, which would produce a marketable gasoline of 60 octane number minimum. It appears fairly certain that little difficulty will be encountered in moving this product.

Pipe line rates to Coraopolis have not been scheduled definitely in the plan due to uncertainties in connection with the tenders of charging stock which may be handled at the various loading terminals. At this time, however, it is estimated that on a basis of a pipe line movement of 3,000 bbls. of straightrun gasoline and 1,000 bbls. of gas oil daily, a rate of 22 cents a barrel applies to points as far north as Clarendon; a rate of 20 cents for the Oil City district, and a rate of 14 cents a barrel at points of tender south of the Oil City district. The Bradford district would not find it necessary to move charging stock south for reforming, as the facilities are easily available in that district.

The Bradford district situation brings up another plan. This plan would be the alternative to a central reforming station for all of the straightrun gasoline producers. This is the district reforming plan. One or more refiners with the proper facilities would convert the gasoline, kerosene and/or gas oil into 60 octane number gasoline for refiners in his immediate territory on a cost plus basis.

The committee studying this alternative plan is composed of Harry Logan, United Refining Co.; L. L. Long, Valvoline Oil Co.; Bert Fisher, Kendall Refining Co.; Guy B. Hunter, Quaker State Oil Refining Co., and D. W. Grant, Pennzoil Co.

The Waverly Oil Works refinery has been shut down for some time. However, a trial run recently indicated that the equipment is in splendid working condition. Cross units are available, and the remodeling necessary to change over to the reforming operation involves little more than the addition of auxiliary furnace equipment. An earlier survey indicated that the gas oil charge could be converted at a cost of 1.5 cents a gallon and a loss of 30 per cent, and the gasoline charge at a cost of .375 cent a gallon and losses ranging from 5 to 10 per cent for a 60 octane material from 48 octane stock. Credits, of course, would lower economic losses.

Bright Stock Problem

With the trend in the automotive field moving definitely toward the use of the lightest oil which will lubricate efficiently, a problem has arisen involving the fate of the large bright stock fraction taken from Pennsylvania Grade crude oil. Some observers have stated that if the Pennsylvania Grade refiners run to stills sufficient crude to meet neutral demand, the runs would go to 78,000 bbls. daily and at the end of the year an excess of 44,000,000 gallons of bright stock would be built up. This view is contested by those who point out that the abnormally high level which has been held by neutral demand in recent months when decreases might have been expected logically does not mean that consumers are responsible for indicated demand, but that middlemen have stocked up far more than they have in the past. If the maintenance of this high level means anything, they say, it is that the refiners' markets are nearing saturation.

However, with the object of cutting down any possible surplus of bright stock which may result from the trend away from the heavier motor oils, a number of refiners are studying the lubricating oil specialty business, particularly in reference to special greases, extremely high flashpoint cylinder stocks and bright stocks, extreme pressure lubricants made from greatly reduced residua. Cutting deeper into the cylinder stock fraction, it is said, would improve the quality of the neutrals. Refiners in the region are reporting an increasing interest, particularly from abroad, in 620, 630 and even 650 steam refined materials.

Western Petroleum Refiners Annual Meeting Designed to Encourage Open Discussion

The twenty-second annual meeting of the Western Petroleum Refiners Association which will be held April 5 and 6 in the Elms Hotel, Excelsior Springs, Mo., promises to be the most interesting group meeting in the Mid-Continent for many months. It comes at a time when refinery operating conditions are so strained that prompt action must be forthcoming in some form or another. The adoption of refinery operating control measures several months ago whereby definite schedules of gasoline production and stocks were to be followed month after month has not proved to be wholly successful and there is a growing belief that an improved plan of more rigid Federal supervision will have to be adopted before all refiners are brought into line.

These topics and others will be open for discussion at the meeting and it is intended that the meetings be designed to encourage as much open discussion of current problems as desired by those attending.

Howard Bennett, president of the association, will probably go beyond the usual brief presidential address to give a clear picture of the present status of the average refiner operating in the Mid-Continent and will attempt to show a way to clarify his future through efforts being made by the Planning and Co-ordination Committee and the oil administrator but which call for the closer cooperation of all plant managers. He hopes to prompt a discussion among those present that will result in definite suggestions for the common good.

Those who are interested in a summary of the work in Washington and the relationship between the Planning and Co-ordination Committee, Oil Administrator Ickes, the Petroleum Administrative Board, and the refining industry will have an opportunity to hear Fayette B. Dow address the convention on Thursday morning.

The technical program promises to be equally interesting to those who represent the manufacturing branch of the refining industry. The complete program, including the tabulation of committee meetings to be held is given below.

TWENTY-SECOND ANNUAL MEETING
WESTERN PETROLEUM REFINERS ASSOCIATION
Elms Hotel, Excelsior Springs, Mo., April 5 and 6, 1934

Thursday Afternoon Session—April 5

2 o'clock.—Informal meeting of Marketing Code Committee, P. M. Miskell, chairman. (Oklahoma, Kansas, and Missouri regional and state Marketing Code Committeemen invited to attend this meeting).

2 o'clock.—Technical Meeting, R. R. Irwin, White Eagle Oil Corp., presiding.

Paper.—Refinery Engineering Development, H. R. Swanson and M. B. Cooke, Alco Products, Inc., New York. (Paper presented by Mr. Cooke.) Discussion.

Paper.—Latest Developments of Metalizing, H. R. Leland, General Metalizing Co., Tulsa. Discussion.

Thursday Night Session—8 o'clock.

Paper.—Operations and Progress of Our Bright Stock Group in 1933, J. R. Mallory, W.P.R.A.

Paper.—Reduction in Number of Grades of Lubricating Oils and Greases and Resultant Benefits, L. C. Eldridge, Shell Petroleum Corp. Discussion.

Open Forum.—Relation of Compounder to the Manufacturer.

Second Day, April 6, 9:30 a.m.

President's Address, Howard Bennette.

Appointment of Committees.

Address.—Petroleum and Washington, Fayette B. Dow, Washington counsel, W.P.R.A., A.P.I., National Petroleum Association.

Paper.—Fitting Natural Gasoline Into the Motor Fuel Market, S. S. Smith, Shell Petroleum Corp. Discussion.

Report of Nominating Committee.

Election of Officers.

Adjournment for lunch.

Afternoon Session, April 6, 1:30 p.m.

Address.—Some Oil Industry Problems, W. R. Boyd, Jr., executive vice president, A.P.I.

Address.—Marketing Section of Code and Related Problems Now Before the Industry, B. L. Majewski, member of Planning and Co-ordination Committee.

Report of Committee on Road Oil.—L. H. Prichard, Anderson-Prichard Oil Corp.

Report of Committee on Tractor Fuel Specifications.—L. R. Crawford, Producers & Refiners Corp.

Reports of other committees.

Report of Resolution Committee.

Convention of Petroleum Geologists Is Marked by New Optimism and Revived Activities

By L. G. E. BIGNELL
Petroleum Engineering Editor

The nineteenth annual meeting of the American Association of Petroleum Geologists, and affiliated divisions, the Society of Economic Paleontologists and Mineralogists and Society of Petroleum Geophysicists, held in Dallas, Tex., March 22-24, was the third largest in attendance with over 1,350 registered members and guests. The meetings at Tulsa in 1927, the registered members and guests numbered 1,827, and at Fort Worth, Tex., in 1929, 1,454 were in attendance. If the number and the spirit of those meetings is to be taken as a criterion as to the rate of recovery in the petroleum industry it may be said that things are moving along very briskly. At the meeting in Houston last year and at Oklahoma City in 1932 only about 900 were present.

Not only was the meeting well attended, with all technical sessions held in crowded auditoriums, but the members were accompanied by their wives and over 400 ladies registered, a record attendance since the Tulsa meeting in 1927. It is a matter of record that over 100 geologists have re-registered in the A.A.P.G. since the beginning of 1933 and have paid up past dues. This indicates that a great many more men are now employed in this division of the industry.

If the geologists are again at work in the field it is a sure indication oil companies are getting ready to start drilling and it is already very evident much new work is actually in progress and many more test wells are contemplated. Throughout the three days' session the geologists and their associates were talking about their work and renewing old friendships. The whole spirit of the meeting was one of revived enthusiasm and optimism which speaks well for the future of the petroleum industry.

"The New Challenge"

Following preconvention meetings of the executive and other important committees the regular sessions started on Thursday, March 22, with an address of welcome by J. Ben Critz, Dallas Chamber of Commerce, and a response and address by Frank R. Clark, retiring president, of the A.A.P.G. Mr. Clark chose for his subject, "The New Challenge," and pointed out that misuse of scientific methods may have been more common than the correct use, and endeavoring to profit by the misuse of technical data to promote selfishness and greed has almost wrecked the petroleum industry by creating a period of overexpansion and overproduction.

"The new challenge to geologists and engineers is much broader than the discovery of oil," Mr. Clark said. "In the future we must concern ourselves not only with the problem of supplying petroleum products to society at reasonable prices, but we must exert our influence and training to the end that the supply does not greatly exceed the consumer's demand. It should not be necessary to involve legal means to curtail the flush production of any oil or any oil pool. The principal obstacle in the way of sane and efficient development and operation of oil fields is selfishness and an utter disregard for the rights of others."

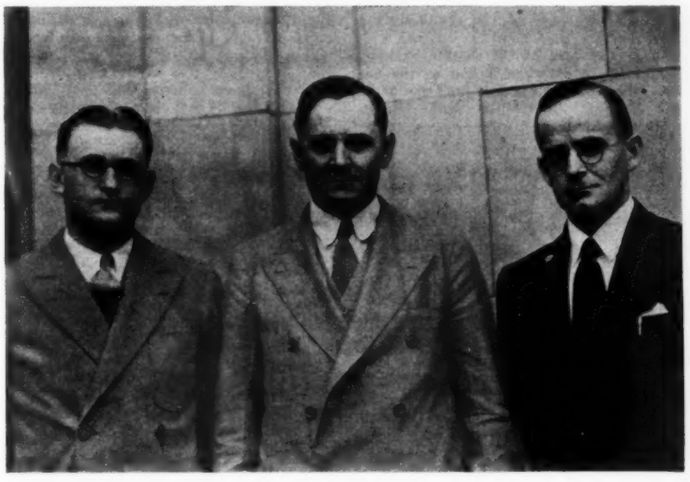
General Association Papers

The program committee in arranging papers for the several technical sessions proceeded along the lines of fewer papers with more time made available for discussions. The first session started after the opening ceremonies Thursday morning and Robert T. Hill, dean of the Texas geologists, spoke on "The Texas Cretaceous Continued." E. DeGolyer followed with "Notes on the Development of the Technique of Oil Finding," and S. A. Thompson closed the morning meeting with a paper upon "The Fredericksburg Division of the Lower Cretaceous with Special Reference to North Central Texas."

During the afternoon meeting on Thursday, L. L. Nettleton, Gulf Research Laboratories, Pittsburgh, Pa., presented a very instructive paper upon "Fluid Mechanics of Salt Domes," illustrated by a series of diagrams and models and pronounced by many to be the best demonstration of this phenomena they had ever witnessed.

Dr. Hugh D. Miser, U. S. Geological Survey, Washington, D. C., presented a paper during the Thursday afternoon session on "The Carboniferous Rocks of the Ouachita Mountains," that proved most interesting and in view of the present activity in the Anadarko Basin in southwestern Oklahoma the discussion by Doctor Miser was timely and valuable.

Frank W. Michaux, Jr., Houston, Tex., read a paper on "A Comparison of the Structural and Reservoir Conditions of the Conroe and Tomball Oil Fields," during the afternoon meeting.



New officers of Petroleum Geophysicists. O. C. Lester, business representative, E. E. Rosaire, president and Frank Goldstone, vice president

Officers Elected

After the technical session the report of the nomination committee was received and William B. Heroy, chief geologist for the Consolidated Oil Co. of New York City, was named without opposition for the presidency. This nomination was in effect an election because no one contested the committee's report. Two nominations for vice president were placed before the meeting. Dr. E. F. Davis, chief geologist for the Shell Oil Co. of California, Los Angeles, Calif., and Edwin B. Hopkins, consulting geologist, Dallas, Tex., were the nominees and the majority votes cast during Friday and Saturday morning were for Mr. Hopkins, making him the new vice president. Frank R. Clark is also a member of the executive committee.

M. G. Cheney, president of the Anzac Oil Co., Coleman, Tex., was made secretary-treasurer of the association by unanimous consent and Dr. L. C. Snider, Cities Service Co., New York, was the only nominee for the position of editor of the A.A.P.G. Bulletin, this being his third year in that capacity.

Paleontologists and Geophysicists

On Friday, March 23, all three groups held technical meetings. The Paleontology and Mineralogy Division held its meetings in the Peacock Terrace in the

(Continued on Page 118)

WILLIAM B. HEROY
President

FRANK R. CLARK
Past President

EDWIN B. HOPKINS
Vice President

DR. L. C. SNIDER
Editor of Bulletin

Factors That Influence Peak Polished Rod Load to Be Taken Into Consideration in Pumping

By M. STONE[1] and W. C. DREYER[2]

There are several important factors which must be taken into consideration to properly apply oil well pumping equipment. To cover all of these in a single article is impractical. However, the analysis of pumping equipment is easily divided into a number of separate problems which may be considered independently.

The first major point encountered in studying this application is peak polished rod load. The size of all parts of the entire pumping system is directly influenced by the maximum load imposed on it every stroke. The peak loads come from the well and are due primarily to the effort required to accelerate and lift the rods and oil on the upstroke.

Calculating Peak Load

The polished rod load could be calculated for any instant from either well data or from the prime mover and pumping unit data providing enough of the unknown variables were known. A calculation of this sort is very involved, and is out of the question practically because a great many of the variable unknown factors can hardly be approximated.

It is possible, however, to make some very simple assumptions and calculate the peak load on the polished rod quite accurately. The first simplifying assumption to be made is that well friction is a negligible part of the peak load occurring in the polished rod. This assumption is often questioned because all wells have considerable friction as evidenced by low well efficiencies. However, this friction is zero at the top and bottom of the stroke. The peak polished rod load occurs after the upstroke has started, at about the time the stretch in the rod has been taken up and any gas space compressed. At this instant the fluid column has hardly started to move so fluid friction is almost zero and it is only on deep wells that the lag of the peak is so great that the rod friction has reached its normal value. It is believed that fluid friction is the major part of well friction even in crooked holes, and particularly when pumping viscous oil.

The second assumption to be made is that the crank is rotating at a uniform rate of speed throughout the stroke. Neglecting angularity of the pitman, this means that the polished rod is assumed to have a sinusoidal motion, $\frac{S}{2}\cos pt$ where $p = \frac{2\eta N}{60}$, t is time from the bottom of the stroke, and S is length of stroke in inches.

This second assumption is compensating but in no way related to the first assumption. The first assumption causes the calculated peak to be less than actual and the second causes it to be greater than actual; however, the two assumptions do not necessarily nullify each other.

Assuming constant crank rotation is exactly the same thing as assuming that the pumping equipment is equipped with an infinitely large flywheel. This assumption eliminates all consideration of counterbalance and flywheel effect of surface equipment from the problem of peak polished rod load because it starts with the worst condition. In other words, no consideration is given to the cushioning effect of the slowing down of the equipment as it takes the peak load.

Counterbalance

Counterbalance is placed in the pumping system to reduce the peak torque load. It does not affect the stress in the polished rod or the walking beam except a small amount due to the change it makes in the speed of the crank during the stroke.

As in the case of the counterbalance, the inertia or flywheel effect of the entire pumping system affects the peak polished rod load only in so far as it changes the speed of the crank throughout each stroke. It should be remembered that peak polished rod loads come primarily from the well and depend upon the weight of rods and oil being lifted and the speed with which it is accelerated at the beginning of the upstroke.

The influence of the prime mover on peak polished rod load is due principally to the inertia or flywheel effect of the drive. A single cylinder engine very often has 500 times as much flywheel effect as the motor that would be used in its place. Multicylinder engines do not have such great inertias and their effects on peak loads are therefore much nearer that of the electric motor.

An engine has another effect on the peak load carried by the polished rod. The torque peaks caused by the engine explosions are periodically imposed on the peak loads coming from the well. Although the peak engine torque may be as much as 30 times the average torque, the large flywheel required by the engine irons these pulsations out so that actually they increase the peak loads coming from the well about 20 per cent. This is the best value that has been found by tests on wells driven by single cylinder engines.

Factors Neglected in Formula

There are a number of other factors that influence peak polished rod load but which are not taken into consideration by the formula. Sometimes one or more of these influence the result appreciably. The effect of slippage of oil by the plunger of the pump is a decrease in actual peak polished rod load not indicated in the calculation. When fluid packed pumps are used this slippage is so great that it must be taken into consideration in calculating peak polished rod load. This is done by taking the percentage of the oil lifted to total pump displacement and multiplying the weight of oil in the formula by this factor. Tests show that oftentimes only 25 or 30 per cent of the weight of oil on the piston is effective in loading the polished rod when a fluid packed pump is used.

The formula uses weights calculated on a basis of depth to the pump. This is the correct basis if the results are to be used in applying equipment, but the height of fluid in the well and the amount of gas in the fluid have some effect on the peak polished rod load. They are in the conservative direction as they make the actual peak load less than the calculated. Further, their effect is of secondary importance. It is rather difficult to take these factors into consideration as the effect is not straightforward but is influenced by such things as the viscosity of the fluid and condition of the fluid and condition of the pumps.

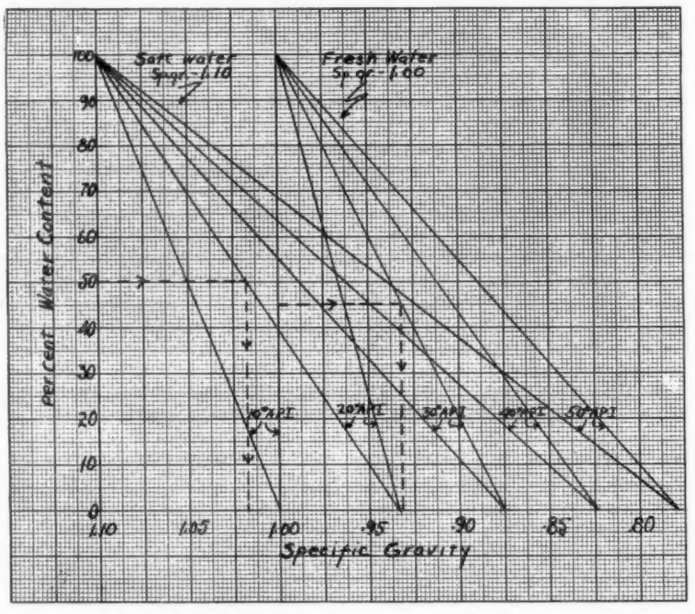


Fig. 1—Specific gravity of oil. Corrected for water content and degrees

The method of operation of the pumping equipment may have a considerable effect on actual peak polished rod loads. Hanger slap and pounding introduce shock loads in the rod that do not show up in the formula. They can be evaluated only by tests.

Formula for Calculating Peak Polished Rod Load

With the two assumptions and neglecting the secondary factors it is possible to say the maximum polished rod load equals the weight of the rods and oil plus the force corresponding to maximum acceleration.

$$RL\ max. = (W_r + W_o)\ (1 + \frac{Sp^2}{2g})$$

Where W_r = Weight of rods in pounds
W_o = Net weight of oil over piston in pounds
S = Length of stroke in inches.
$p = \frac{2\eta N}{60}$ = Speed in radians per second.
N being strokes per minute
g = Acceleration of gravity in inches per second^2 = 386.

Test Data Substantiating Calculated Peak Polish Rod Load

Despite the numerous factors which influence peak polished rod loads, this simple formula is accurate enough for practical purposes. It has been checked by a number of carefully made tests on pumping wells. A comparison of calculated peak rod loads to measured peak rod loads for several typical wells is given in Table No. 1. These tests were made after the same manner as the tests described by H. E. Dralle in his preliminary paper, "Mechanics of Oil Well Pumping," presented at the A.P.I. in Chicago, November, 1930. This entire investigation will be published in full in the near future.

Telemeters on the polished rod accurately measured rod stress which was recorded by an oscillograph. In this way there was no interference with the operation of the equipment nor was any shock absorbing linkage introduced into the system.

Value of Terms for Use in Formula

The formula:

$$RL\ max. = (W_r + W_o)\ (1 + \frac{Sp^2}{2g})$$

is not hard to use. In order to facilitate calculation, Tables No. 2, 3 and 4 and Curve No. 1 gives values of the terms for various pumping conditions.

Values of $(1 + \frac{Sp^2}{2g})$ for a number of pumping speeds and lengths of stroke are shown in Table 2.

W_r in the formula may be a value chosen from Table 3 multiplied by the depth to the pump.

W_o in the formula may be a value chosen from Table 4 multiplied by the depth to the pump and corrected for water content and A.P.I. degrees. The

(Continued on Page 16)

TABLE 1—COMPARISON OF TEST AND CALCULATED PEAK POLISHED ROD LOAD

Test No.	Prime mover—	Load h.p.	Fluid		Depth	Size (ins.)		Strokes per min.	Length stroke (ins.)	Peak rod load	
			Bbls.	Cut, %		Rods	Tubing			Test	Calculated
1	15/35 horsepower motor	18.0	227	88	2,077	⅞	2½	31.9	42	11,000	12,000
4	15/35 horsepower motor	24.5	450	90	2,200	⅞	2½	26.3	45	11,000	11,680
10	25/55 horsepower motor	50.0	780	91	2,600	⅞	2½	27.5	72	15,160	16,000
24	40 horsepower 1-cyl. engine	32.0	150	50	4,440	⅞	2½	21.4	44	20,300	21,250
57	40 horsepower 1-cyl. engine	....	360	93	2,700	⅞	3	21.0	72	19,300	18,600
60	45 horsepower 1-cyl. engine	40.0	175	70	4,430	2½	2½	21.0	56	13,000	*12,900

*Corrected for fluid packed pump by factor of .25.

[1]Research Engineering, East Pittsburgh.
[2]Industrial Engineering, East Pittsburgh, Westinghouse Electric & Manufacturing Co.

Far Eastern Oil Company Serves Thirty Countries Having Over Half of the World's Population

Half way around the world an organization of American oil men have been engaged for many years in selling petroleum products manufactured in the United States and moved abroad in bulk or cases. This organization had no crude supplies or refinery facilities in the Far East, where the markets are.

Next door to these markets another organization, likewise directed by Americans, has been engaged in developing crude production, running the oil through pipe lines and refining it. They had no important nearby markets for these products, hence had to sell them to jobbers with established distribution or transport them for long distances.

When the first company, now the Socony-Vacuum Corp., but until quite a recent date, Standard Oil Co. of New York, went into the Far East, there was no oil business there in what afterwards became large markets. The pioneer salesman had to create a demand and supply it from the United States.

For a long time the New York company had no competition of consequence in the Far East. As its business grew, other companies — notably the Royal Dutch with supplies nearby — made an aggressive entrance into the Standard Oil Co.'s field. In recent years this competition has proceeded at a progressive rate. Eventually it became difficult for a marketer several thousand miles removed from his base of supplies to hold his own against competition from rivals with crude oil and refining facilities much more advantageously located. More and more it became evident to Socony-Vacuum that nearby sources from which to draw petroleum products were not only desirable but absolutely necessary to enable it to keep its business by meeting competition on even terms.

New Company Organized

The economic advantage of uniting the marketing facilities of Socony-Vacuum with the producing and refining properties of the Standard Oil Co. (New Jersey) interests in the Far East was apparent to both managements. It was necessary to organize a new company, the Standard-Vacuum Oil Co., to which would be transferred the interests already mentioned, including the capital stock of the Far Eastern subsidiary and affiliated companies. The new unit was incorporated in Delaware with a capitalization of $10,000,000. The capital stock was distributed to the two parent corporations, share and share alike. Officers of the Standard-Vacuum were chosen from the two old companies on the basis of their experience in the Far East.

Branch offices in the Far East of the Socony-Vacuum Corp., the N.K.P.M. and subsidiaries of Socony-Vacuum, have become part of the Standard-Vacuum Oil Co. organization. The subsidiaries are owned by Standard-Vacuum but each of them will continue to operate its properties and conduct its own business as before.

W. B. Walker, vice president of Socony-Vacuum, heads the new company, with G. S. Walden, general manager of N.K.P.M., as senior vice president. Other vice presidents are H. Dundas of Socony-Vacuum, E. F. Johnson of the Jersey company, and P. W. Parker of Socony-Vacuum. C. A. Thompson of Socony-Vacuum is general counsel. E. T. Singer and B. D. Southerland of the same company are treasurer and secretary, respectively, with A. Pattison, Jr., of Jersey, as comptroller. Directors, in addition to the president and vice presidents, are J. H. Congdon and F. H. Fitzgerald of Socony-Vacuum and A. L. Mellar, T. E. Mobley and A. H. Tomlinson of Jersey.

The N.K.P.M. has valuable producing acreage in Talang-Akar and elsewhere in the Dutch East Indies, together with a 25,000-bbl. capacity, fully up-to-date refinery in Sumatra. Socony-Vacuum has a widespread marketing organization all through the eastern hemisphere, notably in Japan, China, British India, Australia, New Zealand, Oceana, South and East Africa.

The merger provides a wide outlet for the crude and refined products of the N. K.P.M. and an abundant source of supply close at hand for Socony-Vacuum's marketing field.

Forty years ago the first little group of pioneers of Standard Oil salesmen landed in China with a new fuel called kerosene. For centuries the Orient had relied upon vegetable, animal and whale oils for scanty illumination in crude lamps of native design.

Kerosene was more efficient than those laboriously garnered products but it would not burn properly in the native lamps. Undiscouraged, the company manufactured small tin lamps with glass chimneys, gave them away or sold them by the thousands and millions at a price which the humblest coolie could afford. Every lamp created a market for kerosene, for native oils could not be used in them.

Establishing a Market

In the beginning, practically the only product sold was kerosene. Candles the Orientals made from native vegetable oils. Castor oil was employed to lubricate the railways of India. In Japan, rapeseed yielded products for lighting and lubrication on the Imperial railroad. So it was a century-hardened wall of prejudice which the foreign salesmen of the old Standard Oil Co. had to break down to establish a market for paraffin wax, lubricants and other petroleum products. Gasoline was never thought of in those days for any commercial purpose. Today there are 41,000 cars in China, 100,000 in Japan and 500,000 in Australia. The Fiji Islands boast more than 1,000 autobomiles. More than 17,000,000 bbls. (50's) of motor fuel were sold in 1932 in what will now be the marketing branch of the Standard-Vacuum Oil Co.

As the business of Socony expanded in the three original markets of India, China and Japan, new territories were also being developed. The combined Far Eastern properties of the former Standard Oil Co. of New Jersey and Vacuum Oil Co. extend over an area representing one-fourth of the earth's surface. About 54 per cent of the entire population of the earth is concentrated in these 30 countries. Instead of merely kerosene, here is the list of the more important products marketed in the Dutch East Indies, Australia, Africa and the Asiatic countries today:

Gasoline, kerosene, lubricating oils (in-

Facts of Interest in the Far Eastern Merger

PRODUCTION—Important properties in Talang-Akar and elsewhere in the Dutch East Indies, with current output of around 25,000 barrels daily.

REFINERIES—One refinery at Java and one recently completed modern, fully equipped plant in Sumatra, D. E. I., with daily capacity of 25,000 barrels.

TERRITORY—Thirty countries with a total population of more than a billion, 54% of all the people in the world, will be served by the marketing organization.

PLANTS—41 can factories; 11 box plants.

STORAGE—1,300 tanks with total capacity of approximately 15,000,000 barrels.

MARINE EQUIPMENT—206 steamers, lighters, barges, tugs, launches, junks and sampans.

TANK CARS—308 cars, not including those leased.

MOTOR VEHICLES—1,078.

AIRPLANES—2.

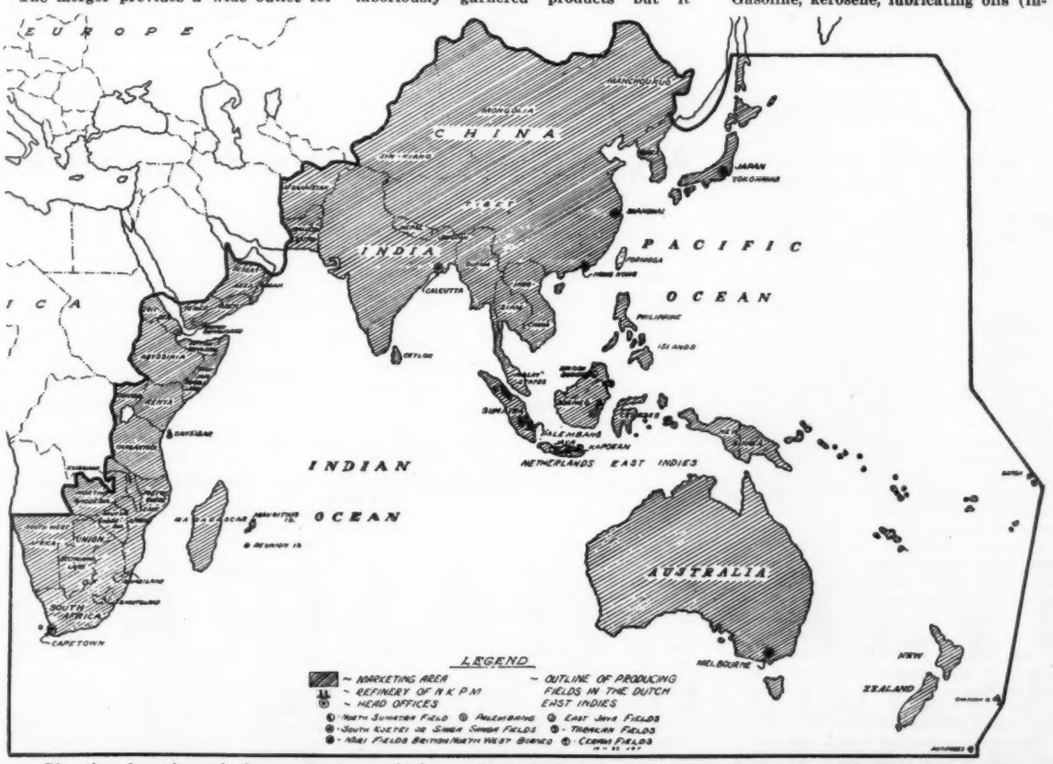
STATIONS AND AGENCIES—2,261 installations, 676 service stations, 3,287 agencies.

DISPENSING EQUIPMENT—16,865 agency-operated curbside and portable pumps.

AUTOMOBILE REGISTRATION—1,398,559 in the countries served by the new company.

1932 CONSUMPTION—66,000,000 barrels (50's) of all products.

TOTAL PERSONNEL—16,750.



Showing location of the producing, refining and marketing properties involved in the Far Eastern merger

From The Lamp.

dustrial, marine, automotive, railway, etc.), greases, wax, asphalt, road oils, solvents, fuel and Diesel oils, candles, specialty products, lamps, heaters, ovens, aviation fuel and lubricants, and turpentine.

The Vacuum Oil Co., Pty., Ltd., chief marketing unit of Socony-Vacuum in Australia, is the largest petroleum organization in the commonwealth. The company maintains large manufacturing plants at Melbourne, Sydney and Perth, numerous bulk installations and more than 9,000 curbside pumps. Forty years ago it was a tiny sales agency supplying lub oils for gold mining machinery.

The Far Eastern territory today has been divided roughly into six sectors which clear through home offices in Australia, Japan, China, India and South Africa, as follows:

Melbourne — Australia, New Zealand, Pacific Islands.

Yokohama—Japan proper, Korea, Formosa.

Shanghai — North China, Manchukuo, Mongolia, Sinkiang, Tibet.

Hong Kong—South China, Philippines, Indo-China, Siam, Dutch East Indies, British Borneo, Federated Malay States.

Calcutta—India, Burmah, Ceylon, Afghanistan, Baluchistan, Nepal, Bhutan, Hadhramaut (Aden), Yemen, part of Oman.

Cape Town—Union of South Africa, Southwest Africa, Bechuanaland, Basutoland, Swaziland, northern and southern Rhodesia, Kenya, Uganda, Tanganyika, Zanibar, Portuguese East Africa, Mauritus, Reunion, Madagascar, St. Helena, Ascension, Eritrea, Italian, French and British Somaliland, and Ethiopia (Abyssinia).

N.K.P.M.

On the side of the New Jersey company, the Nederlandsche Koloniale Petroleum Maatschappij with its holdings in the Dutch East Indies, among others becomes a part of the new Far Eastern organization. There are more than 5,000 islands in the Dutch East Indies group, varying in size from the tips of submerged mountains to one that is three-quarters the size of the State of Texas. The most important are Java, Sumatra, Borneo, Madoera, Celebes and Dutch New Guinea. Were it possible to transplant these islands and lay them across the United States we would find the tip of Sumatra extending out into the Pacific around the California-Oregon state line and practically the entire area of New Guinea in the Atlantic Ocean off the Carolinas, with others of the group scattered in between.

Into this countless maze of islands the N.K.P.M. came in 1912. For many years the going was pretty discouraging, and in 1920 the directors were nearly ready to dispose of the company's assets and abandon their efforts. In 1922 the luck turned. At a depth of 2,000 feet below all previously known producing horizons a new well came in on the Talang-Akar concession in southern Sumatra, in a formation which for years had been considered hopeless as an oil-bearing sand. Within a year the field proved so promising that construction of a refinery and pipe line was decided upon.

Today the major producing operations of the N.K.P.M. are confined to the residency of Palembang in southern Sumatra, although two small fields have been developed in East Java. Wells have been drilled in accordance with the most advanced engineering practice, gas produced with the oil being processed to remove casinghead, after which the volume not needed for fuel in operating the lease is forced back into the sand. In this way the original pressure is maintained to a remarkable degree and it is expected that the major part of recoverable oil will be produced without pumping or gas lifting. Isolated wildcatting has been carried on by the company in Sumatra, Java and Borneo.

Getting Out the Oil

The construction of a pipe line out of the field was a tremendous job, ranking in difficulties with the building of the Andean line through the jungles of Colombia.

Before a length of pipe was laid the engineers had a difficulty to consider. The crude coming from the Talang-Akar wells, because of its high paraffin content, solidifies at relatively high temperatures. The drop of only a few degrees causes the oil to become sluggish to such an extent that it cannot be pumped any distance. Even such a slight fall in the thermometer as from 79 to 75 degrees would cause it to thicken so that it could not be handled through the pumps. Consequently it was necessary to construct the line above the record high water mark at all points—and wherever possible, to bury it below the surface of the ground.

The engineers had to construct 50 kilometers of earthen dike through almost impassable jungle, build bridges and trestles through the swamps and over rivers. Ninety miles of double line, 6 and 8-inch, were laid with the aid of carabao water buffalo, native pack animals and coolie labor. The destination of this steel highway through the jungle was the N.K.P.M. refinery at Soengei Gerong near Palembang, Sumatra. The company also operates a small refinery in Java, but the main plant is at Palembang.

Work was started in 1923 on the staggering job of erecting a refinery in the jungle. An area of 100 acres was cleared at the junction of the Komering and Moesi Rivers, about 60 miles inland from the sea. On a foundation of filled in sand and with the aid of piles sometimes 90 feet long, a 3,000-bbl. refinery was completed by 1926. This has since been enlarged and modernized and today it has a capacity of 25,000 bbls. daily and occupies a site of 1,000 acres.

Talang-Akar crude, having stumped pipe line engineers on how to get it out of the field without the oil solidifying, next confronted refinery technicians. With a large percentage of paraffin the crude would not flow at ordinary temperatures. Even after cracking the fuel oil derived from it showed so high a pour test as to be unsatisfactory for bunker purposes. Gasoline produced from cracking such a highly paraffin stock had a marked tendency to knock in automobile engines.

To overcome these difficulties, a battery of vacuum pipe stills was installed and the crude reduced to a very low pitch bottom. A paraffin plant was constructed which not only turned out a considerable quantity of refined waxes but enabled the company to produce a highly satisfactory cracked gasoline by removing the objectionable paraffin. Up-to-date cracking coils and other equipment permit intensive processing of the crude to obtain maximum yields.

Getting the oil into the Palembang refinery was not the only transportation problem. It was also a job to get it out. At high tide 19 feet is the maximum permissible draft at the mouth of the Moesi River — and tankers in the Far East draw approximately 30 feet. The company constructed a bulk loading terminal at Tandjong Oeban, on the island of Bintang, about 30 miles south of Singapore, equipped to load the largest tank steamers.

Petroleum Administration Bill Now About Ready

(Continued from Page 9)

Florida, Kentucky, Tennessee, Alabama, Mississippi, Louisiana, Oklahoma, and Texas.

Oil Administrator's Views

"The minimum wages as now provided in the oil code are as low as it is reasonable for any branch of the industry to pay," Administrator Ickes said in announcing the disapproval of the committee recommendation. "Any downward revision of these minima would be entirely out of harmony with the administration's recovery program and work an immediate hardship on thousands of employes.

"One of the fundamental aims of the National Recovery Act and the general recovery program is the elimination of wages of the type proposed by the committee in this recommendation which I have disapproved. The proposal would have affected a very large percentage of employes in the states it was intended to cover because many filling stations employ only one helper, the average is about 2.5 and relatively few employ as many as five persons."

The Secretary approved during the week minimum wage rates for oil drillers and helpers recommended by the Planning and Co-ordination Committee. The minimum wage for rotary tool drillers was established at $1.25 an hour, and for their helpers at 75 cents per hour. Minimum wages for cable tool drillers were set at $1 an hour, while their helpers' rate was put at 87½ cents an hour. The order states that hourly wages now being paid in excess of these minima shall not be reduced.

The administrator today announced that he had disapproved a recommendation of the Planning and Co-ordination Committee that prohibitions against unfair price discounts be relaxed.

The committee recommended that an order recently issued by the administrator which annulled all contracts made since August 19, 1933, providing for discounts to commercial consumers be modified to affect only contracts made since February 1, 1934.

Attorneys for several of the oil companies contended that although their contracts violated the code prohibition against discounts, the violations were made in good faith because of an incorrect interpretation of the code provision. They contended that persons holding the contracts, by threatening suits, prevented them from cancelling their contracts.

Petroleum Administrative Board attorneys recommended the disapproval of the proposal, advising Mr. Ickes that it would permit companies which obtained business by violating the code to keep it at the expense of those abiding by the code.

Revisions in the credit terms of the oil code to assist consumers and political subdivisions in their credit relations to the petroleum industry were announced today by the petroleum administrator. One provision of interest to the consumer allows more time in which to pay his gasoline bill, giving until the end of the month succeeding the month of purchase for payment of the bill. The code previously required payment by the fifteenth of the month following the date of purchase.

Public hospitals and agencies of political subdivisions were exempted from the credit rules of the code. Because of this exemption Administrator Ickes cancelled a code provision permitting the acceptance of scrip or warrants from governmental agencies in payment of bills, as such a provision is no longer necessary.

Factors That Influence Peak Polished Rod Load

(Continued from Page 14)

curves shown in Figure 1 offer a convenient way of finding the specific gravity factor to use to make this correction.

After choosing these three values corresponding to pumping conditions, the calculation of the peak polished rod stress is a matter of simple addition and multiplication in accordance with the formula.

TABLE 2

Values of $(1+\frac{Sp^2}{2g})$

Pumping speed strokes per min.	Stroke lengths—inches					
	24	34	44	54	64	74
1	1.000	1.000	1.00	1.00	1.000	1.001
5	1.009	1.012	1.015	1.019	1.023	1.026
10	1.034	1.048	1.062	1.076	1.090	1.104
12	1.049	1.069	1.090	1.111	1.131	1.152
14	1.067	1.094	1.122	1.150	1.178	1.206
16	1.087	1.124	1.160	1.196	1.233	1.269
18	1.111	1.157	1.203	1.249	1.295	1.341
20	1.136	1.193	1.250	1.307	1.364	1.421
22	1.165	1.234	1.303	1.371	1.440	1.509
24	1.196	1.278	1.360	1.442	1.524	1.605
26	1.231	1.327	1.423	1.519	1.615	1.711
30	1.307	1.435	1.563	1.691	1.820	1.947
32	1.402	1.596	1.770	1.945	2.120	2.295

TABLE 3—WEIGHT OF SUCKER RODS

Rod diameter (ins.)	Weight per foot
1/2	.750
9/16	.950
5/8	1.115
11/16	1.400
3/4	1.650
7/8	2.250
1	2.950

W_r in formula is above weight per foot times depth to pump.

TABLE 4—WEIGHT OF OIL ON PISTON

Lbs. per foot of depth basis 10° A.P.I. S.P. Gr.=1.00

Diameter of pump barrel	Diameter of rods (ins.)			
	⅝	¾	⅞	1
1 1/16	.251	.193	.124	.044
1 1/2	.631	.574	.505	.425
1 3/4	.907	.849	.779	.700
1 15/16	1.145	1.086	1.017	.934
2	1.228	1.169	1.100	1.020
2 1/4	1.590	1.530	1.460	1.380
2 3/8	1.785	1.730	1.660	1.577
2 7/16	1.885	1.830	1.760	1.680
2 1/2	1.993	1.933	1.865	1.785
2 3/4	2.440	2.380	2.310	2.23
3 3/4	4.65	4.56	4.525	4.44

W_o in formula is a value chosen from above table and corrected for °A.P.I. and water content, from curves in Figure 1, and multiplied by depth to pump.

Administrator's Report on Crude Stocks

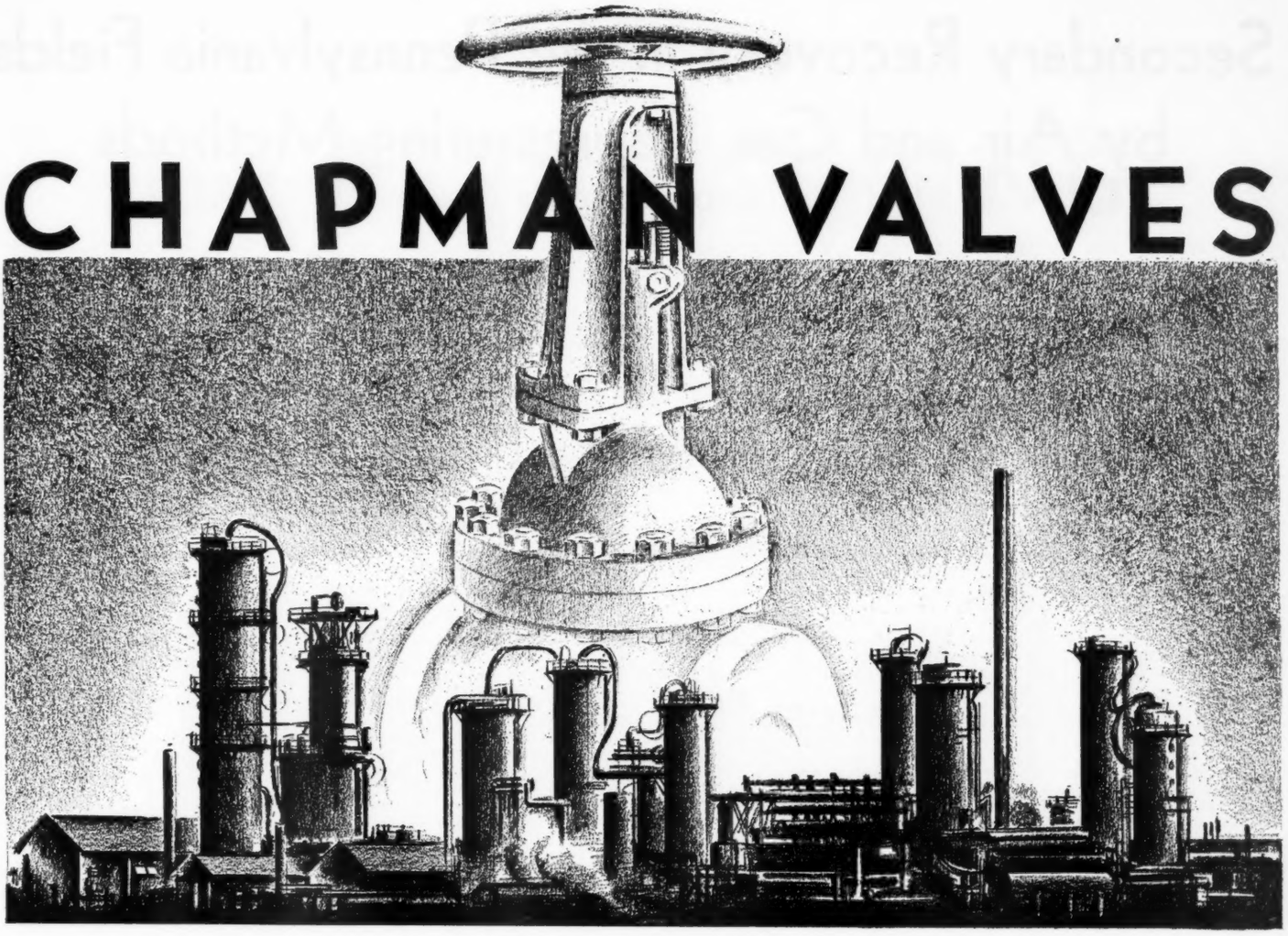
Stocks of domestic and foreign crude petroleum at the close of the week ended March 17 totaled 338,987,000 bbls., an increase of 496,000 bbls. over the total of 338,491,000 bbls. on hand at the end of the preceding week, Harold L. Ickes, Secretary of the Interior and administrator of the code of fair competition for the petroleum industry, announces. This increase, which follows a decrease of 625,000 bbls. during the previous week, was composed of an increase in stocks of domestic crude oil of 709,000 bbls. and a decrease in stocks of foreign crude oil of 213,000 bbls.

Current reports of the oil industry indicate that crude oil production increased approximately 65,000 bbls. over the previous week, or from a daily average of about 2,380,000 bbls. for the week ended March 10 to 2,445,000 bbls. for the week ended March 17. Daily average crude runs to stills also increased substantially, amounting to 2,410,000 bbls. as compared with 2,300,000 bbls. for the previous week. Daily average crude imports were 60,000 bbls., a slight decrease from the previous week.

CRUDE PETROLEUM STOCKS REPORTED BY COMPANIES HOLDING 100,000 BBLS. OR MORE

	Stocks held by reporting companies		Change from
	Mar. 10, 1934 (bbls.)	Mar. 17, 1934 (bbls.)	Mar. 10, 1934 (bbls.)
Pennsylvania Grade	5,094,000	5,021,000	—73,000
Other Appalachian, including Kentucky	1,362,000	1,347,000	—15,000
Lima, Northeast Indiana, Michigan	1,619,000	1,571,000	—48,000
Illinois, Southwest Indiana	11,130,000	11,204,000	+74,000
North Louisiana and Arkansas	11,530,000	11,423,000	—107,000
West Texas and Southeast New Mexico	30,405,000	30,472,000	+67,000
East Texas	43,565,000	43,582,000	+17,000
Other Mid-Continent	153,375,000	154,308,000	+933,000
Gulf Coast	15,512,000	15,266,000	—246,000
Rocky Mountain	27,533,000	27,584,000	+51,000
California	33,563,000	33,619,000	+56,000
Total domestic crude	334,688,000	335,397,000	+709,000
Foreign crude	3,803,000	3,590,000	—213,000
Total crude	338,491,000	338,987,000	+496,000

CHAPMAN VALVES



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Secondary Recovery in the Pennsylvania Fields by Air and Gas Repressuring Methods

By ROBERT C. CONINE

OIL CITY, Pa., Mar. 26.—Preparations are being completed in the middle and lower Pennsylvania oil fields for secondary recovery developments which will invite the long needed outside capital to make these areas high ranking factors in the petroleum industry. For some of the operators, the beginning will be on a small scale and their choice of repressuring equipment will be generally that described in this article, that is, that involving a minimum investment with a promise of satisfactory results. Other operators, whose earlier repressuring practices have placed them in a good position to enhance their properties, will extend their efforts to recovery from more than one sand and will feature suitable pattern arrangement in the injection and producing well networks.

There are compensating factors which tend to make a comparison of a successful water flood operation in the Bradford Field with a successful air-gas repressuring operation in the Oil City-Titusville district much less one sided. For instance, two wells in a particularly fine Bradford flood began producing a total of 105 bbls. a day in October, 1933. The wells are now producing 70 bbls. daily, and will continue to taper, if the normal course works out, until practical production ceases in five years or less. Seven years ago an air-gas repressured well was brought in south of Warren with an initial production of 6 bbls. a day, and is still producing at a rate of 3 bbls. a day without reconditioning of any kind. Four wells can be completed in the air-gas repressuring area for the cost of one well in the Bradford Field.

In Titusville District

The natural advantages enjoyed by operators in the Titusville district, for instance, were listed by C. C. Hogg in his discussion of a paper on producing formations and practices in the district by Norman E. Maxwell, as follows: (1) The productive sand is shallow. Every foot of hole costs money and every foot of pipe that has to be used is additional expense, not only in the well itself, but in the equipment that is necessary to handle it. (2) We have sufficient gas for operating purposes, and in many cases for repressuring the sand. (3) Good fresh water for all requirements is abundant. The oil sands carry very little water. (4) There are five productive sands. In some localities they may all be found under the same farm. (5) Neither the oil, gas nor water contain impurities that are harmful or excessively corrosive. (6) The productive sands are highly permeable, while the barren sands are very hard and tight. This is decidedly to our advantage in secondary repressuring. (7) The cost of acreage is ridiculously low. (8) We are next door to some of the most progressive and complete refineries, and in the midst of leaders in the manufacture of oil field equipment.

The area is particularly suited to secondary recovery by use of air and gas as displacement media and there has been considerable experimentation to evolve the most efficient pattern design. Three-spot, five-spot and seven-spot networks have proved satisfactory where carried out consistently. The possibilities of still further developments in pattern arrangements may be seen in the experience of R. M. Haskell, described in the May 24, 1928, issue of The Oil and Gas Journal, in the Bradford Field where the sand is much tighter and less responsive to the air-gas repressuring method:

"The area consists of 41 wells, drilled from 1,885 to 1,895 feet, situated on 266 acres. This gives a well spacing of one well to 6.48 acres. Pressure was first applied to this area in October, 1925, through nine intake wells, whose daily input averages 68,000 feet of air at 300 pounds pressure. The action of the pressure was relatively quick, in many cases bringing wells having average normal production of 0.25 bbl. per day up to as high as 12 bbls. per day in less than two months. While all of the 41 wells showed some effects from pressure, only 22 of them gained the full effects of it."

The unbroken condition of the Bradford sand, which makes it suitable for water flood development, and the texture of the formation, it seems evident, eliminated channeling of air and trapping of oil in shale pockets. In the broken sand area where the use of water flood is impractical, channeling of the repressuring media and trapping of oil are avoided by controlling pressures and circumscribing properly by injection wells the area to be drained. Theoretically, it is indicated, a fuller understanding of underground conditions will enable air-gas repressuring operators to increase their production considerably. Apparently the most successful pattern is the one which will permit the maximum introduction of gas-air volume to the producing sand without channeling or trapping.

Cost of Repressuring

The erroneous impression is prevalent that the cost of initiating a repressuring program using air and/or gas is prohibitive for small operators. The fact is that an operator can complete his repressuring station for $4,000 or less, and can buy the best and fullest equipment for his pressure well for about $137, not including casing, pipe and tubing which are priced by the foot.

The accompanying diagram of a repressuring plant is typical of the stations favored by operators who cannot afford more costly outlays. The two-stage compressor will range in price from $1,200 to $2,000; the oil or gas engine of 40 or 50 horsepower will range in cost from $1,360 to $1,800. This engine will handle 150,000 to 250,000 feet of air-gas per 24 hours, depending, naturally, upon the pressure. The building can be built for $300, including cement floors, foundations, etc.

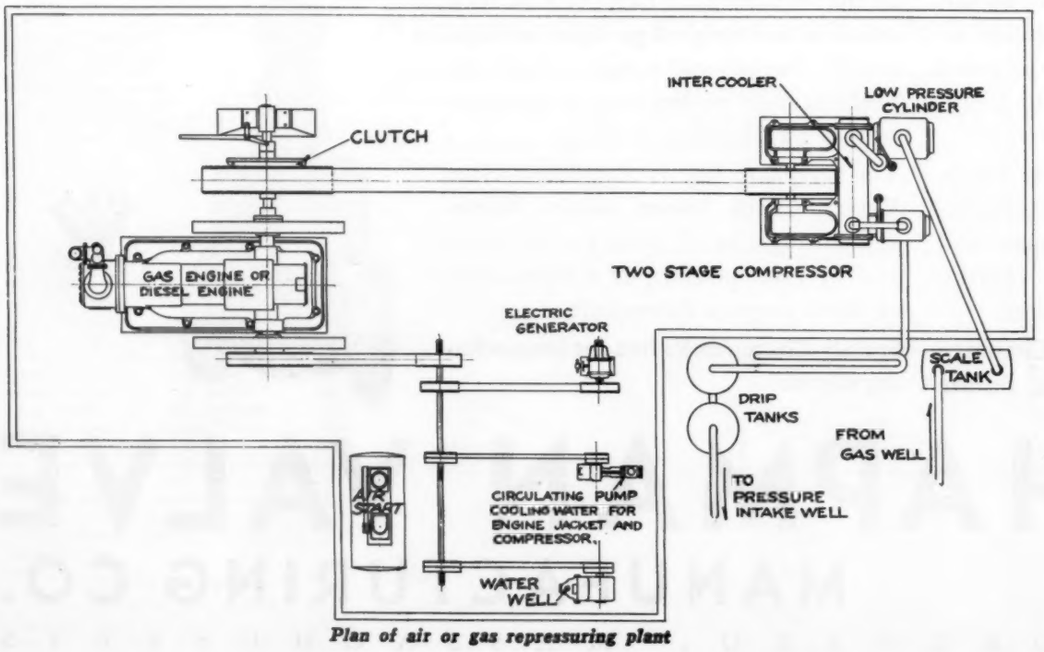
If fuel oil is used in 24-hour daily operation, the cost per month, at 6 cents per gallon, will be $70. If there is sufficient lease gas this cost can be eliminated, although it is considered better practice to return as much gas as possible to the producing sands. A 40 horsepower engine will use about 10,000 feet of gas a day. Some operators effect further economies by constructing their own intercoolers and aftercoolers.

The second diagram shows a typical arrangement of an air-gas injection well for applying repressuring media to two oil sands.

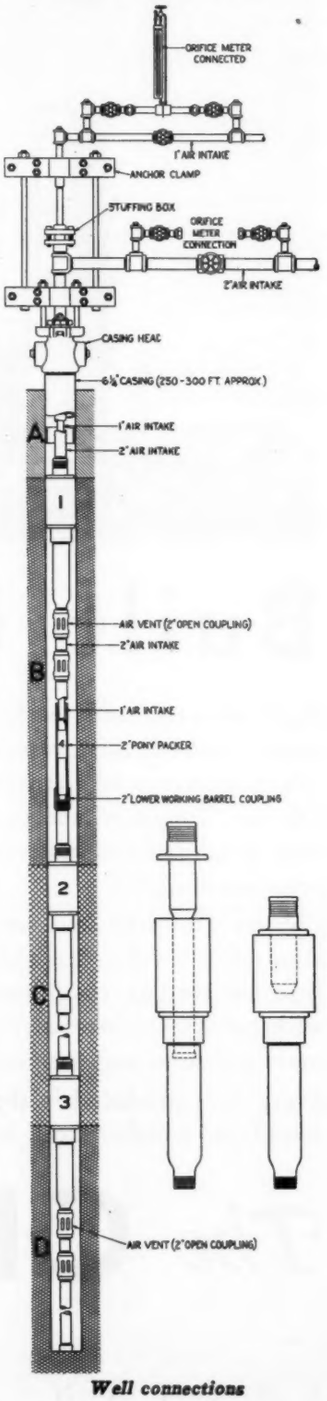
Recommended Procedure

The recommended procedure in air-gas repressuring operations is as follows:

(Continued on Page 116)



Plan of air or gas repressuring plant



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NEWS FROM FOREIGN LANDS

VENEZUELA

The Venezuela Gulf Oil Co. is drilling three tests in what is known as the Anzoatiqui Field near the central part of the State of Anzoatiqui in the eastern part of Venezuela. This section of the country has been receiving attention from several companies and interesting developments are expected before the end of the year.

The Gulf subsidiary the latter part of last year completed its No. 1 Oficina, a wildcat test. It was reported that this test secured a large flow of gas but no oil at a depth of 6,184 feet. This area is in the district of Freites, about 75 miles northwest of Ciudad Bolivar on the Orinoco River and supplies are taken overland from the river to the camp and drilling sites.

The company is drilling a second test adjoining the first. About 18 miles south and east of this discovery the company in January started drilling a second test. Ten miles north of the original test another test has started drilling. These three tests spread out over an area of approximately 30 miles are expected to definitely determine whether this particular section of eastern Venezuela will be developed for substantial crude oil production.

Drilling is active in the Quiriquire Field located in the District of Piar, State of Monagas, the only commercially producing area in eastern Venezuela. The present production of the field is in excess of 20,000 bbls. daily. The Standard Oil Co. of Venezuela (Standard of New Jersey) which controls the field is completing a new export terminal at Guiria on the southern coast of Paria Peninsula which will expedite the movement of the oil which will be transported by small tankers to Guiria from Caripito located on San Juan River near the field.

RUMANIA

Crude oil production in January showed an increase of 68,000 tons (476,000 bbls.) or 11 per cent over January, 1933. The January production totaled 650,000 tons or 147,000 bbls. daily, which compares with 582,000 bbls. (131,000 bbls. daily) in January, 1933.

The following table gives the January production in tons of the 10 largest producers:

Astra Romana	140,320
Concordia	94,755
Steaua Romana	94,547
Romano Americana	65,555
Phoenix	59,036
Prahova	46,936
Creditul Minier	34,478
Colombia	19,726
Dacia-Starnaphta	13,027
I.R.D.P.	7,595

Latest available reports show that French refineries have materially increased their purchases of Rumanian crude oil. Purchases in December totaled 73,327 tons. Other purchases were: England, 51,106 tons; Italy, 49,779 tons; Egypt, 35,261 tons, and Germany, 28,539 tons.

IRAQ

Reports in United States and foreign countries that the pipe line of the Iraq Petroleum Co. extending from the company's producing properties to two terminals on the Mediterranean will be completed next month and oil delivered to the lines, is denied in official circles. Although the construction work is ahead of schedule with the laying of the pipe completed in December, 1933, the line will not be ready for regular operation before late summer. Some time will be required to fill the lines and actual deliveries of crude oil are not expected to start until around October 1.

It is anticipated that the northern division of the line will be completed and placed in operation first. This line has a Mediterranean terminal at Tripoli. The other division of the line which crosses into Palestine has its terminal at Haifa.

European reports indicate that the allocation of the crude oil which will be available starting in the fall has been completed by the four companies which own 95 per cent of the stock of the Iraq company. These companies are the Anglo-Saxon Petroleum Co. (Royal Dutch-Shell), D'Arcy Exploration Co. (Anglo-Persian), Compagnie Francaise des Petroles (French interests) and the Near East Development Co. (Standard Oil Co. [New Jersey]), Gulf Oil Corp. and Socony-Vacuum Corp.

Starting with initial deliveries around 25,000 bbls. daily it is expected that within six months after the completion of the line, approximately 75,000 bbls. daily will be made available at the two terminals. The crude oil, it is said, will be entirely absorbed by refineries of the parent companies with the bulk of the Iraq production going to plants already operating in France and owned by subsidiary or affiliated companies.

MEXICO

The Mexican government has determined the production taxes which are to be effective for March. These taxes are to be based on the following values: Fuel oil, 27.17 silver pesos per cubic meter, which equals $1.20 per barrel; gasoline, 86.54 silver pesos per cubic meter, which equals 9.09 cents per gallon; kerosene, 52.02 silver pesos, which equals 5.47 cents per gallon.

Based on these values, the following taxes are effective for March:

	Tax per cubic meter	Tax in U. S. currency
Crude (sp. gr. 0.93 = Be. 20.38)	3.140 pesos	$0.13867 per bbl.
Crude (sp. gr. 0.96 = Be. 15.68) or heavier	1.907 pesos	.08422 per bbl.
Fuel oil (sp. gr. 0.95 = Be. 17.21)	2.934 pesos	.12957 per bbl.
Gasoline (crude)	3.462 pesos	.00364 per gal.
Gasoline (refined)	1.731 pesos	.00182 per gal.
Kerosene (crude)	3.121 pesos	.00328 per gal.
Kerosene (refined)	1.561 pesos	.00164 per gal.

The production tax on fuel oil will vary approximately .01062 per barrel for each degree of specific gravity above (deduct) or below (add) 0.95 specific gravity.

The production tax on light crude will vary approximately .01137 per barrel for each degree of specific gravity above (deduct) or below (add) 0.93 specific gravity.

COLOMBIA

The Colombia Petroleum Co. (Gulf) in its second test in the Barco concession of Colombia has encountered hard drilling formations according to field reports and for that reason the test has not reached the depths expected earlier in the year. The test is now drilling at a depth slightly below 1,700 feet with rotary tools. It may be necessary to move in cable tools to complete the test, a development which would delay the work several months. The company has also spudded in a third test which is located about 3 miles south of the first test which was completed a year ago making one of the most important discoveries in several years. The first test which produced large quantities of oil at a depth of a few hundred feet, caught fire which destroyed its test value and it was later plugged and abandoned. The two tests were started for the purpose of testing deeper formations.

The Colombia company is owned by Gulf Oil Corp. (75 per cent) and the Carib Syndicate, Ltd. (25 per cent). It owns the Barco concession obtained by grant from the Colombian government consisting of 1,250 square miles in North Santander which is about 200 miles from Cartagena. The wildcat drilling which is now being carried on by the Colombian company is in accordance with the terms of the contract between the company and the government, which became effective in 1931. By the terms of the contract the concessionaire is required to carry on certain test drilling within a period of five years. In the event that commercial production is found the Colombian company is obligated to build a pipe line to the coast and also build a refinery. These clauses of the contract do not become effective until the production exceeds 21,000 bbls. of crude oil daily.

In the Catatumbo River district which is 100 miles north of the two tests now drilling, the Colombian company is moving in material for a test of that part of the concession. This test will be drilled a short distance from the original Doherty test which was drilled in 1919 when the concession belonged to the Henry L. Doherty interests. Drilling equipment and supplies are being moved in by water and a camp established. It is not expected that actual drilling will start until late spring or fall.

Production

While there is little change in the crude oil production of the older fields in Colombia, the trend in crude oil runs to stills is upward. Present crude oil production is averaging from 30,000 to 35,000 bbls. daily. Crude oil runs to stills have increased to more than 4,000 bbls. daily. The bulk of the crude oil is shipped to Canada for refining at the plants of the Imperial Oil, Ltd. The following table gives the crude oil production and refinery crude runs to stills at refineries in Colombia for 1933 (data in barrels):

	Crude oil output	Refinery runs
January	999,079	78,113
February	1,028,692	89,163
March	1,212,328	74,934
April	1,086,292	69,389
May	1,161,270	93,840
June	1,106,470	75,275
July	1,182,461	62,035
August	1,154,879	93,113
September	1,079,949	18,987
October	1,082,630	26,050
November	991,883	106,036
December	985,317	126,235
Total	13,071,250	913,170

From the refinery operations the following products were manufactured: Gasoline, 284,991 bbls.; lubricating oils, 15,910 bbls.; fuel oil, 463,480 bbls.; gas oil, 31,360 bbls.; absorption oil, 6,036 bbls. and asphalts, 21,805 bbls. A total of 137,289 bbls. of natural gasoline were used in refinery blending. This product came from plants in Colombian fields.

PORTO RICO

Culminating several weeks of disagreement between government officials and company representatives as to a fair price for gasoline on the island, District Attorney Domingo Massari has brought formal charges against four companies alleging unfair trade practices. The four companies named are: British Shell (Dutch-Shell), West India Oil Co. (Standard of New Jersey), Texas Co. and the Pyramid Oil Co. (British owned). These companies are the four major distributors of gasoline in Puerto Rico. It is alleged that they have restrained competition, fixed wholesale and retail prices and have refused to sell to dealers who will not agree to sell the gasoline at prices established by the companies.

PERSIA

The crude oil and natural gasoline production in Persia for February totaled 569,786 tons or 3,988,502 bbls. of 42 gallons each. In January the Persian production totaled 594,970 tons or 4,164,790 bbls. Figured on a daily basis the production in February averaged 142,000 bbls. and 134,000 bbls. in January.

Revised figures for 1933 show that the production in January of that year totaled 509,000 tons and in February, 419,000 tons or a total of 928,000 tons for the two months. This is equivalent to an average daily production of 110,000 bbls. for the first two months of 1933.

Venezuela Gulf Oil Company Wildcat

Oficina No. 1 camp from water tower

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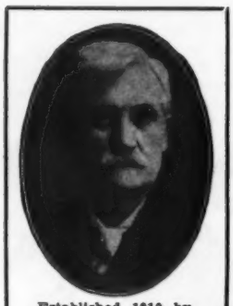

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Survey of Refineries

The Oil and Gas Journal's Annual Refinery Survey published in this issue shows, as expected, a numerical increase in plants but a relatively small increase in capacity.

During the period of low prices the new plants built were mainly small, temporary refineries constructed in fields where distress crude was available, chiefly in East Texas.

Although their total capacity was comparatively small their cut-price products being injected into the market during unsettled times were sufficient to cause refined oil prices to be depressed and held below the level that would permit a reasonable profit to the industry as a whole and below the level that would sustain the price paid for crude oil. In fact, the setting up of a number of these plants could be attributed solely to the fact that crude oil was available in that area below the posted price.

The progress of developments, however, threatens their continuance. Owners of these plants will soon have to make a decision whether they are to lend support to a program of maintaining uniform and profitable prices that will bring refined oil quotations to a level which will permit them to pay posted prices for their crude oil supply, plus a reasonable profit on their operations, or whether they will persist in their present practices until forced out of business.

Those plant owners who wish to stay in business must realize that if they are to secure protection of their own interests in future months they must adhere to a program benefiting the industry as a whole. They can have no such assurance by continuing as free lances depending upon distress conditions which are nearing an end.

They have to depend upon markets outside the state which may be closed against them by Federal laws.

Their source of crude supply may be cut off or the government may take over the industry in which case they will have to take their chances of making a profit on the same plane as everybody else.

The decision upholding the new Texas law giving the railroad commission authority over refineries and the aroused sentiment in that state for strict enforcement of the law should be a warning.

Hopeful Development

The most hopeful development of the week was the conference at Chicago on modifications of the marketing agreement and the report that the desired additional signatures were being secured which are expected to be supplemented by East Texas accessions at the meeting in Dallas this week.

The fact that the Federal oil administration is going ahead with its preparation of a bill to be submitted to Congress increasing government control of the industry is probably not being overlooked by the conferring marketing factions.

Nor should it be. It cannot be too often and too persistently emphasized that if the industry wishes to retain any semblance of self-government it must prove its ability by coming to agreement without having the government knock its heads together.

Intimation that the proposed bill will provide for possible extension of government control after the 1935 date when the NRA is scheduled to end should be a further warning to the squabbling factions.

Some of the battling contenders who have been congratulating themselves on having blocked the other fellows' play by delaying action will feel mighty small when they realize what both sides have lost to the government.

The unseasonable growth of gasoline stocks is a sufficient commentary upon the ineffectiveness of refinery allocations. The new controversy over refinery control, whether it should be based upon production or inventories, is as likely as not to end in a decision by the oil administration that may please neither side.

It surely seems that reasonable men, knowing what results must be secured, could reach a fair method without undue advantage to anyone if they would abandon hope of selfish benefit.

That, however, has been the bane of the whole code controversy. There has been more effort to get an advantage through it than to make it work for the general good.

We passed through the same experience in the early day of co-operation for curtailment of crude production. Producers just could not see how it could benefit them to co-operate if one held an advantage.

It took years of dearly paid for experience to teach them that there was more revenue for each of them in co-operation than in cut-throat competition that reduced all of them to the verge of bankruptcy.

With that example it might have been thought the refining branch would have seen the point more easily. But perhaps the comparison is doing the refiner an injustice. After all, real progress in curtailing crude production was not attained until State authority was invoked. Even then it had to wait for Federal authority to get where we are.

Possibly that is how it will be with the refining and marketing branches, also. It is simply a question whether those branches will make their own rules or have rules imposed upon them.

The California situation would appear to be reason for haste. First the cartel which was supposed to iron out all of California's troubles, had a monkey wrench thrown into it by the Department of Justice which has caused another diversion by securing the indictment of marketers for what it charges are violations of the code but which the defendants deny to be violations, a view it is reported also entertained by Administrator Ickes. If this is so it adds another complication, subjecting the industry in effect to two administrators, one in the Department of the Interior and one in the Department of Justice.

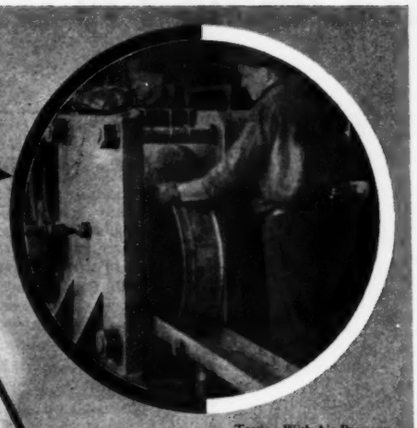
The danger that demoralization in the California markets may result in distress Pacific gasoline reaching the East Coast should lead to speedy agreement among the disputing elements east of the Rockies.

Within a month the industry's main consuming season will be opened. The records show that when the industry failed to get its house in order before that opening, it never has been able to overcome that handicap throughout the season.

There must be a common purpose to make this season profitable.

NRA MEMBER U.S. WE DO OUR PART

FACTORY PRECISION TAKES THE "GUESS" OUT OF JOINT-MAKING



Testing With Air Pressure —the last of 10 operations on a Dresser middle ring.

EACH operation in the making of a Dresser joint, except actual field assembly, is factory controlled. Each joint is built by factory experts working under the most ideal conditions, with the most modern equipment. These factory-made joints are so simple that uniformly dependable installations are made in the field with a minimum of effort and skill. Accuracy in the factory permits the greatest speed and efficiency on the job and has made it possible for three generations of pipeliners to rate "100% perfect" in pipe-joint making.

S. R. DRESSER MFG. COMPANY
Bradford, Pa.

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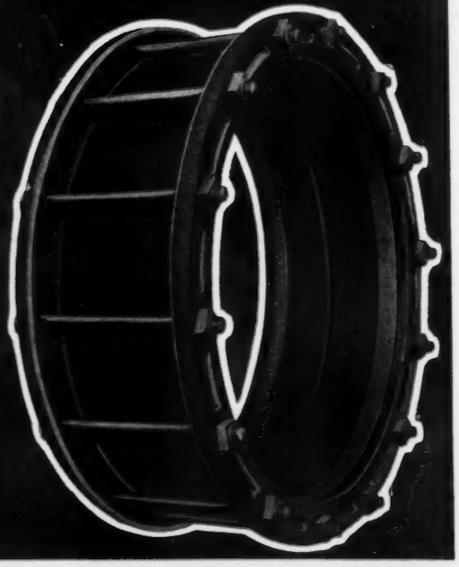


DRESSER COUPLINGS DOMINATE!

Gasolines Drift to New Lows in Group 3 Market But Decline Is Believed to Be Near Its End

By T. F. SMILEY

Refinery gasoline and natural gasoline continued their search for the bottom of the market in Oklahoma (Group 3) territory this week. Both were crawling around among new lows for the current decline, but observers were disposed to believe that the downward movement of these products had about run its course.

Shutdowns in the East Texas area were credited with acting in some degree as a corrective of a sick motor fuel market. About 15 plants, chiefly in the Gladewater district, are reported to have been closed, thus relieving the pressure a little and creating a semblance of price resistance on the part of refiners who continued to operate. The market dropped to a resale low of 2⅞ cents Oklahoma for low-octane material late last week, but the plant shutdowns, along with a few other mildly encouraging developments, imparted enough strength to bring quotations up to 3 and 3⅛ cents.

Rumors of undetermined origin gained circulation to the effect that several hundred cars of distress gasoline were to be purchased, supposedly under the sanction of the petroleum administration in Washington, with a view of stabilizing the market. Notwithstanding the foggy character of these rumors, their persistence brought a few buyers out of hiding; but when it became apparent that this quantity buying was only a dream, to the extent at least that such buying was to have no part in the immediate future of gasoline, jobber demand dried up and refiners faced the same old scarcity of orders.

An order of 100 cars of gasoline for coastwise movement, placed in East Texas, was the first one that had appeared this month, but it was too small to exert any appreciable effect on the market, and no new coastwise or export business was in sight.

Talk heard a week ago foreshadowed the refinery shutdowns which have taken place. There was wide expression of a belief that market stagnation had approached a point which would leave to many refiners no alternative other than to close their plants. There is no way of telling without a detailed survey just how many of the suspensions were directly the result of trade conditions, but while a few owners may have closed for repairs most of them unquestionably took the step because nobody wanted the gasoline.

A bit of comfort was extracted from reports that producers of hot oil in the East Texas Field who had been selling their product for 30 to 35 cents a barrel were now asking 55 to 60 cents because of indications that there was to be stricter surveillance of operations under the new state law placing refineries under control of the Railroad Commission. Estimates of illegally produced crude lent little support, however, to the theory that offenders were getting scared. These estimates placed the daily output of East Texas hot oil at 55,000 bbls. Largely as a consequence of this condition the tank car gasoline market, notwithstanding improving retail business, continued to drift downward.

Planning to Help Naturals

Natural gasoline, like the refinery product, lost another eighth-cent all along the line. The 1⅜ cents quoted for 26-70 material in Oklahoma and the 1¼ cents North Texas are declared to be at least 1 cent below the cost of manufacture. Some sales of 26-70 at 1¼ cents were reported early this week. This was distress material, but enough of it was said to be available to threaten maintenance of the regular market at 1⅜ cents.

Deplorable conditions in the natural gasoline industry are to be a subject of thorough discussion at the convention of the Western Petroleum Refiners Association in Excelsior Springs, Mo., April 5 and 6, according to plans formulated last Friday at an informal meeting in Tulsa of about 15 representatives of large integrated companies in the Mid-Continent territory which produce both refined and natural gasoline. A committee composed of A. P. Ruether, of the Shell Petroleum Corp., St. Louis, and A. T. Scherer, of the Sinclair Prairie Oil Co., Tulsa, was appointed to make a survey of conditions in the natural gasoline industry and make recommendations for the immediate future. A paper representing the natural gasoline men's outlook, entitled "Fitting Natural Gasoline in the Motor Fuel Market" and making recommendations for permanent correction of existing difficulties will be presented at the convention. It is expected the convention will take some action calculated to lift the natural gasoline business out of conditions which result in demoralizing it in every period of slack demand.

Many considerations enter into the problem, necessitating co-operation between the refiner and the natural gasoline manufacturer. It is recognized that one great step toward a stabilized market would be the substitution of contract buying for the spot buying which now prevails.

Slack Periods Present Problems

Some method must be devised which will enable the refiner who does not operate his own recovery plant to buy and store natural gasoline during the seasons of slack demand and which will enable the refiner who does have his

(Continued on Page 28)

Refined Oil Market Barometer

Gasoline prices in all areas except Pennsylvania exhibited weakness, especially in the Mid-Continent and East Coast. In the Chicago and Gulf Coast districts there were signs of recovery. Natural gasoline market demoralized, with distress material available at less than cost of production. Other products steady.

Mid-Continent—Refinery and natural gasolines continue downward movement. Little change in rest of list.

East Coast—Fuels strong. All grades of gasoline weak and price situation unsettled.

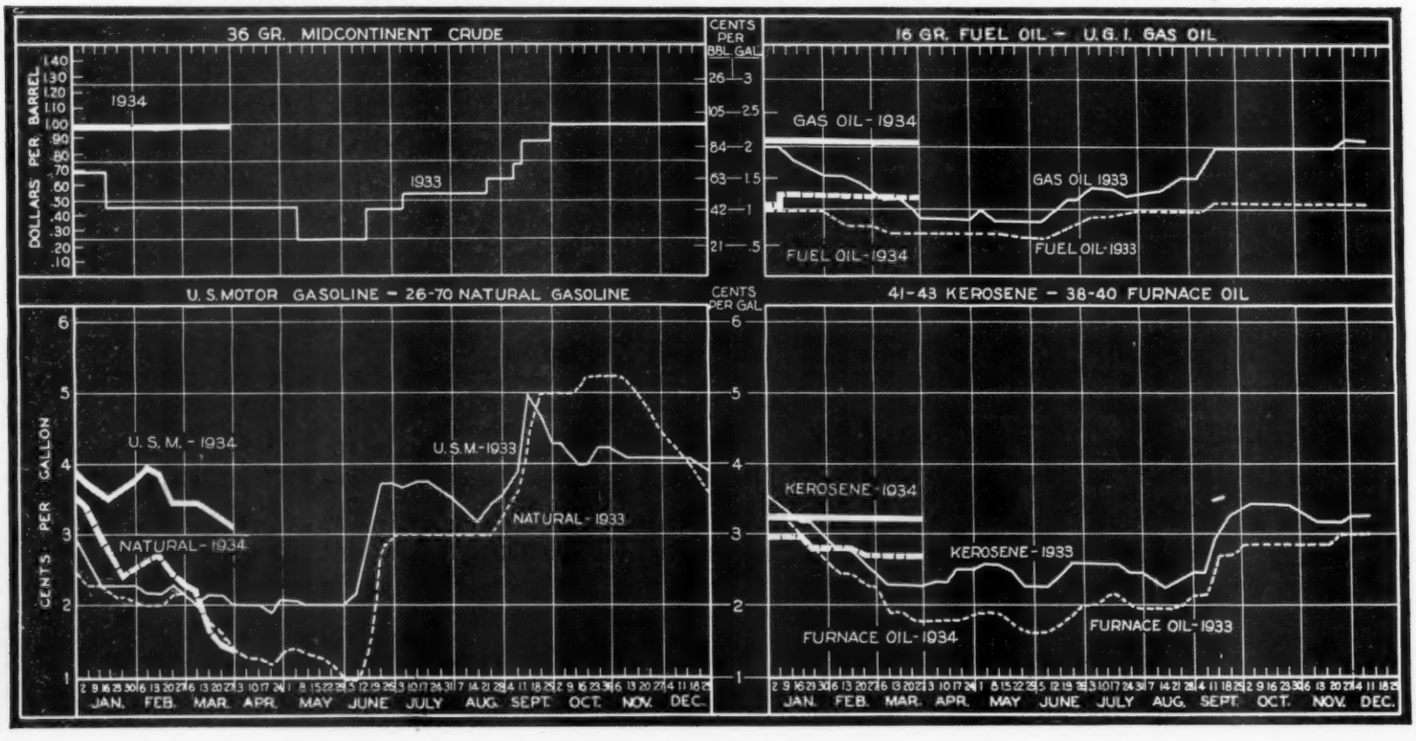
Gulf Coast—Gasolines suffered sharp weakening, but steadying at former levels. Other products steady.

Pennsylvania—Gasolines firm, with prices advanced. Fuel oil and kerosene stronger.

California—Destructive gasoline war still on. Prices reduced still further in San Francisco.

Chicago—Gasoline somewhat steadier, but at low prices. Kerosene active and strong. Industrial fuels in demand.

Representative Mid-Continent Quotations on Crude Oil and Refined Products Basis Oklahoma (Group 3)



Bunker Fuel Oil Prices Increased in East and at Gulf Coast While Gasoline Remains Weak

By C. O. WILLSON
New York Bureau, The Oil and Gas Journal

NEW YORK, Mar. 26.—Two developments of the past week reflect the refinery tank car market situation in the eastern part of the United States. On Wednesday, March 21, the Standard Oil Co. of New Jersey advanced bunker fuel oil 10 cents per barrel at points along the Atlantic Seaboard and subsidiary companies made a similar advance at Gulf Coast bunkering points. The new prices range from $1.15 per barrel (42 gallons) at the Gulf to $1.30 at New York, Norfolk and Baltimore. All the major factors in this market met the advances as soon as they were announced.

On Friday, March 23, the Standard Oil Co. of New York, Inc., reduced gasoline tank wagon and service station prices 1½ cents per gallon on regular grade gasoline in Greater New York, and 1 cent per gallon on the third grade. The new prices on the regular grade are 14.5 cents tank wagon and 15.5 cents service station, and 1 cent per gallon less on the third grade at service stations. These prices include 3-cent state and 1-cent Federal taxes.

These price changes are in line with the general tank car market in which fuels are strong and all grades of gasoline are weak and the price situation unsettled. Up to this writing the substantial price decline in gasolines had not spread to upper New York, New England and the Standard of New Jersey marketing territory and it was hoped that the reductions could be confined to metropolitan New York until it was definitely known what action would be taken at Washington to remedy conditions in the motor fuel market in all parts of the country brought about by excessive stocks accumulated during the winter months.

As in the case of heavy fuels, the refinery market in this territory except for the gasolines appeared firm and prices steady. Although some observers believe the markets on cylinder stocks and wax is easing off in demand a check of the major refiners making Pennsylvania and Mid-Continent stocks and all grades of wax failed to reveal any price changes of general importance.

Fuel Contracts

The advance in bunker fuel quotations was the first this year and places prices at the highest levels in this territory since February 10, 1928, when it was quoted at $1.35 per barrel. On May 5, of that year the price dropped to $1.25 and continued in a downward price trend until October 16, 1931, when a price of 60 cents was made effective by the major sellers. This low price continued until March 25, 1932, when it was advanced to 65 cents starting a slow recovery in quotations through 1932 and 1933. The price changes made effective in 1932 and 1933 were as follows: 1932—March 25, 65 cents; May 10, 75 cents; June 21, 85 cents; September 12, 75 cents; 1933—July 6, 85 cents; August 24, 95 cents; September 11, $1.10; December 1, $1.20. The highest point reached in bunker fuel oil at the East Coast was in 1920 when a price of $2.84 per barrel was posted on December 7. Prices fluctuated between a low of $1.25 and a high of $1.80 over a five-year period extending from January 1, 1923, through 1927.

The price advance comes at a time when large and small sellers are much concerned as to the probable market for all grades of fuels including furnace oils and gas oils over the next year. The bulk of these products is sold on long-time contracts extending over a period of one year or more. Many sellers have not benefited from the improved markets in the oil fuels over the past several months for the reason that the bulk of their output was being sold on contracts with flat prices which have been below the open market quotations. For instance, at this time although the posted price has been advanced to $1.30 per barrel on bunker fuel at refineries and terminals in this section, a large part of the output is being sold on contracts at prices under $1 per barrel. Cases are reported in which two and three-year contracts were made with shipping interests at a flat or maximum price of 75 cents and these contracts will extend through 1934 regardless of what happens in the open market quotations.

These contracts and other unfavorable agreements naturally will not be renewed on the same basis when they expire but it will require a year or more before the refining industry generally in this section will benefit in full from the improved markets for fuels which has been under way for approximately one year.

It is probable that the next development will be a general advance in refinery prices for gas oils and all distillates used as furnace oils and Diesel fuels. Ordinarily at this time of the year distributors of furnace oil are busy closing contracts with consumers covering their next season's requirements. This has been delayed this year in many cases because refiners are not certain as to the basis on which these prices should be established. The season which is now closing exceeded expectations as to volume and several refiners and jobbers of furance oils had difficulty in keeping adequate supplies on hand.

Expect Higher Prices

It is certain that prices on most grades of distillates will be higher next season. Many made contracts with consumers last year based on the expectation that refinery prices would continue at their 1932 and early 1933 levels and when quotations advanced, did not have an adequate margin to cover their tank wagon operations. For instance, in Philadelphia a popular grade of furnace oil whose specifications were established by a large burner manufacturer, was sold over the season at a flat delivered tank wagon price of 5 cents per gallon. Allowing 2 cents for tank wagon delivery and service this meant a refinery or bulk terminal price not exceeding 3 cents per gallon. The refinery price advanced above this level in the early part of the season.

The confusion at this time is partly due to the uncertainty as to what action will be taken at Washington in regard to control over the refinery operations for the balance of the year and probably next year. It is now apparent that too much crude oil was run to stills over the past six months from the standpoint of gasoline demand and it is assumed that any new plan will provide for an effective curtailment and thus prevent the accumulation of excessive stocks.

At the same time these winter crude runs to stills did not bring about an excess production of the heavier oils. Thus, if crude runs to stills are curtailed in this country over the next year compared to the year ending April 1, the output of these heavier oils will decrease and in individual cases at least both small and large refiners will not be in a position to take care of their regular trade. It is expected that the demand for furnace oil will increase next season and with a continued improvement in industrial and marine conditions there also will be a greater demand for the residual oils.

Import Tax a Factor

It is known that this condition has been discussed by representatives of local refiners and was presented last week to the oil administration officials at Washington. The problem in brief is to curtail gasoline production and not at the same time create a shortage in the heavier oils. In these discussions the importance of the import tax which became effective in 1932 is becoming more and more appar-

(Continued on Page 115)

American Petroleum Institute Weekly Refinery Statistics

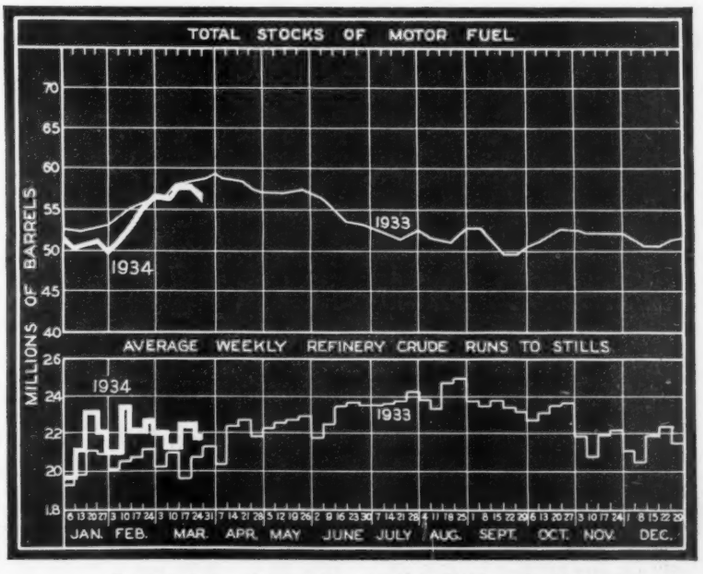
Figures below reported for week by American Petroleum Institute. (1) Per cent refinery capacity represented. (2) Daily average crude runs to stills. (3) Total motor fuel stocks. (4) Gas oil and fuel oil stocks. All figures in 42-gallon barrels.

Week Ending March 24, 1934, Compared to Week Ago

	Week ending March 24, 1934				Week Ending March 17, 1934			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
East Coast	100.0	465,000	17,244,000	5,436,000	100.0	495,000	17,105,000	5,412,000
Appalachian ...	92.6	82,000	1,936,000	673,000	92.6	81,000	1,946,000	644,000
Ind., Ill., Ky. ..	97.3	290,000	8,716,000	2,926,000	97.3	313,000	8,722,000	3,123,000
Okla., Kans., Mo.	82.1	211,000	5,969,000	2,761,000	82.1	216,000	5,938,000	2,817,000
Inland Texas ..	60.2	85,000	1,494,000	1,627,000	60.2	85,000	1,546,000	1,525,000
Texas Gulf	98.1	445,000	5,164,000	4,377,000	98.1	440,000	6,062,000	4,479,000
La. Gulf	100.0	107,000	1,813,000	1,367,000	100.0	122,000	1,826,000	1,515,000
N. La. and Ark.	92.6	38,000	373,000	598,000	92.6	45,000	349,000	594,000
Rocky Mtn.	78.8	36,000	1,098,000	691,000	78.8	24,000	1,106,000	694,000
California	96.9	400,000	13,272,000	85,052,000	96.9	437,000	13,168,000	86,442,000
Total U. S. ...	92.4	2,159,000	57,079,000	105,508,000	92.4	2,258,000	57,708,000	107,245,000

Week Ending March 24, 1934, Compared to Year Ago

	Week ending March 24, 1934				Week ending March 25, 1933			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
East Coast	100.0	465,000	17,244,000	5,436,000	99.1	472,000	15,486,000	6,200,000
Appalachian ...	92.6	82,000	1,936,000	673,000	95.0	83,000	2,039,000	820,000
Ind., Ill., Ky. ..	97.3	290,000	8,716,000	2,926,000	97 5	298,000	8,494,000	3,394,000
Okla., Kans., Mo.	82.1	211,000	5,969,000	2,761,000	84 9	218,000	5,522,000	2,919,000
Inland Texas ..	60.2	85,000	1,494,000	1,627,000	56.4	84,000	1,775,000	2,058,000
Texas Gulf	98.1	445,000	5,164,000	4,377,000	97 7	382,000	6,837,000	5,861,000
La. Gulf	100.0	107,000	1,813,000	1,367,000	97.3	114,000	1,984,000	2,055,000
N. La. and Ark.	92.6	38,000	373,000	598,000	88 5	36,000	266,000	644,000
Rocky Mtn.	78.8	36,000	1,098,000	691,000	90.8	25,000	1,569,000	623,000
California	96.9	400,000	13,272,000	85,052,000	94.6	373,000	14,775,000	98,431,000
Total U. S. ...	92.4	2,159,000	57,079,000	105,508,000	91.6	2,085,000	58,747,000	123,005,000



Data based on weekly reports of American Petroleum Institute

REFINERY AND CRUDE PRICES

Quotations on refined products are for interstate or export movement except as otherwise noted

The following quotations are exclusive of the Federal excise taxes of 1 cent a gallon on gasoline and 4 cents on lubricating oils.

Refinery Gasolines

Oklahoma (Group 3):	Mar. 27		Mar. 20	
U. S. Motor grades:				
Below 60 octane	.03⅛	.03¼	.03¼	.03⅜
60-64.9 octane	.04	.04¼	.04⅛	.04¼
65-70 octane	.04¼	.04½	.04⅜	.04½
60-62 400 grades:				
Below 60 octane	.03¼	.03⅜	.03⅜	.03½
60-64.9 octane	.04⅛	.04½	.04½	.04⅝
65-70 octane	.04½	.04⅝	.04⅝	.04⅝
64-66 375	.03½	.04	.04	.04¼
68-70 360	.04⅛	.04½	.04⅜	.04½
NORTH TEXAS—				
U. S. Motor grades:				
Below 60 octane	.03⅛	.03¼	.03¼	.03⅜
60-64.9 octane	.04	.04¼	.04⅛	.04¼
65-70 octane	.04¼	.04½	.04⅜	.04½
60-62 400	.03¼	.03⅜	.03⅜	.03½
64-66 375	.03⅞	.04	.04	.04¼
68-70 360	.04⅛	.04½	.04⅜	.04½
NORTH LOUISIANA (Ark., No. La. & Miss. del.)—				
U. S. Motor grades:				
Below 60 octane	.03¾		.03⅞	
60-64.9 octane	.04⅛		.04⅜	
65-70 octane	.05⅛		.05⅛	
60-62 400	.03¾		.03¾	
ARKANSAS (Ark., No. La. & Miss. del.)—				
U. S. Motor grades:				
Below 60 octane	.03¾		.03⅞	
60-64.9 octane	.04¾		.04⅞	
65-70 octane	.05⅛		.05⅛	
CHICAGO (based on Oklahoma Group 3)—				
U. S. Motor grades:				
Below 60 octane	.03⅛	.03⅜	.03¼	.03½
60-64.9 octane	.04	.04¼	.04⅛	.04⅜
65-70 octane	.04⅜	.04⅝	.04½	.04¾
60-62 400	.03¼	.03½	.03⅜	.03⅝
64-66 375	.04⅛	.04¼	.04¼	.04⅜
68-70 360	.04⅜	.04½	.04½	.04⅞
Aviation fighting grade	.04⅞	.05⅛	.04⅞	.05¼
PENNSYLVANIA (inland refineries)—				
58-60 U. S. Motor:				
Below 60 octane	.04¾	.05	.04½	.04¾
60-64.9 octane	.06⅜	.06½	.06⅜	.06½
65-70 octane	.06¾	.07	.06	.06⅛
64-66 375	.06	.06⅛	.06	.06⅛
68-70 350	.06¼	.06½	.06¼	.06½
CALIFORNIA (domestic movement)—				
54-58 U. S. Motor	.04	.05	.04	.05
58-60 400	.04½	.05½	.04½	.05½
EAST COAST—				
U. S. Motor, below 60 octane:				
New York	.05½	.05¾	.05½	.05¾
Baltimore	.05½	.05¾	.05½	.05¾
U. S. Motor, 60-64 octane:				
New York (Bayonne)	.05¾	.06	.05¾	.06
Philadelphia	.05¾	.06	.06	.06¼
Boston	.0620		.0620	.0645
Baltimore	.05¾	.06	.05¾	.06
Charleston, S. C.	.05¾	.06	.05¾	.06
U. S. Motor, 65 and above:				
New York (Bayonne)	.06		.06	.06¼
Philadelphia	.06	.06¼	.06¼	.06½
Boston	.0670		.0645	.0670
Baltimore	.06	.06¼	.06	.06¼
Charleston, S. C.	.06	.06¼	.06	.06¼
GULF COAST (domestic)—				
U. S. Motor:				
Below 60 octane	.05		.05	
60-64.9 octane	.05⅛	.05¼	.05⅛	.05¼
65 octane and higher	.05½		.05½	

Naphthas

	Mar. 27		Mar. 20	
PENNSYLVANIA (inland refineries)—				
50-52 430-450 (blending)	.04⅜	.04⅝	.04⅜	.04⅝
52-54 430-450 (blending)	.04⅜	.04⅝	.04⅜	.04⅝
54-56 430-450 (blending)	.04⅜	.04⅝	.04⅜	.04⅝
CHICAGO (based on Oklahoma Group 3)—				
50-52 450 (blending)	.03½	.03¾	.03¾	.04
Cleaners' naphtha, 56-58 gr., 200 i.b.p.-330 e.p.	.06	.06½	.06⅛	.06½
Lacquer diluent, 180 i.b.p.-250 e.p.	.07⅛	.07½	.07¼	.07½
Lacquer diluent, 140 i.b.p.-200 e.p.	.08⅛	.08½	.08¼	.08½
Rubber solvent, 68-70 gr., 100 i.b.p.-300 e.p.	.06	.06½	.06⅛	.06½
Stoddard solvent, 300 i.b.p.-410 e.p., over 83° flash	.05⅝	.06	.05¾	.06
Pet. thinner, 290-300 i.b.p.-415 e.p., over 83° flash	.05⅝	.05¾	.05⅞	.06
V.M.&P. naphtha, 56-58 gr., 190-200 i.b.p.-330 e.p.	.06¼	.06⅜	.06¼	.06½
Petroleum spirits	.05⅛	.05⅜	.05⅜	.05⅝

Natural Gasolines

OKLAHOMA (Group 3)—	Mar. 27		Mar. 20	
Grade 26-70	.01⅜	.01½	.01½	
Grade 18-55	.01⅞	.02	.02	
Low vapor pressure grades:				
15 lb. v.p. (max.)	.02	.02¼	.02⅛	.02⅜
11 lb. v.p. (max.)	.02¾	.02⅞	.03¼	.03½
NORTH TEXAS—				
Grade 26-70	.01¼	.01⅜	.01½	
Grade 18-55	.01¾	.01⅞	.01⅞	.02
Low vapor pressure grades:				
15 lb. v.p. (max.)	.01⅞	.02	.02⅛	
11 lb. v.p. (max.)	.02⅝	.02¾	.03⅛	.03⅜
NORTH LOUISIANA—				
Grade 26-70	.01¾		.01⅞	
CALIFORNIA—				
75-78 375	.04½	.05	.04½	.05

Kerosenes

(All kerosenes water white)

OKLAHOMA (Group 3)—	Mar. 27		Mar. 20	
41-43	.03¼	.03½	.03¼	.03½
42-44	.03½	.03⅝	.03½	.03⅝
NORTH TEXAS —				
40-41	.03⅛	.03¼	.03⅛	.03¼
41-43	.03¼	.03⅜	.03¼	.03⅜
NORTH LOUISIANA (Ark., No. La. & Miss. del.)—				
41-43	.03¾		.03¾	
42-44	.04		.04	
ARKANSAS (Ark., No. La. & Miss. del.)—				
41-43	.03¾		.03¾	
PENNSYLVANIA (inland refineries)—				
45	.04¾	.05	.04⅝	.04⅞
46	.04⅞	.05¼	.04¾	.05⅛
47	.05¼	.05½	.05⅛	.05⅜
CHICAGO (based on Oklahoma Group 3)—				
41-43	.03⅜	.03½	.03¼	.03½
42-44	.03½	.03⅝	.03½	.03⅝
CALIFORNIA (Pacific Coast consumption)—				
38-40 high burning test	.04¼	.04¾	.04¼	.04¾
NEW YORK (Bayonne, N. J.)—				
41-43	.05¾	.06	.05¾	.06
GULF COAST (domestic)—				
41-43	.04¼	.04½	.04¼	.04½

Petroleum Coke

Prices per ton f.o.b. refineries in Chicago area. (Refineries will absorb freight to 80 cents a ton)

	Mar. 27	Mar. 20
Breeze (screenings)	5.00	5.00
Pile run	5.00	5.00
Direct from still	6.00	6.00
Lump and egg	8.00	8.00

Furnace Oils and Tractor Fuels

(Zero cold test under 190° flash and good odor)

OKLAHOMA (Group 3)—	Mar. 27		Mar. 20	
32-36 straw	.02⅝	.02¾	.02⅝	.02¾
36-38 straw	.02⅝	.02¾	.02⅝	.02¾
38-40 straw	.02¾	.02⅞	.02¾	.02⅞
39-41 prime	.02⅞	.03	.02⅞	.03
NORTH TEXAS—				
38-40 straw	.02¾	.03	.02¾	.03
NORTH LOUISIANA (Ark., No. La. & Miss. del.)—				
36-40 furnace oil	.03		.03	
ARKANSAS (Ark., No. La. & Miss. del.)—				
32-36 furnace oil	.02¾	.02⅞	.02¾	.02⅞
CHICAGO (based on Oklahoma Group 3)—				
32-36 straw	.02⅝	.02⅞	.02⅝	.02⅞
38-40 straw	.02¾	.02⅞	.02¾	.02⅞
38-40 prime white	.02⅞	.03	.02⅞	.03
PENNSYLVANIA (inland refineries)—				
40-41 prime white	.04⅜	.04½	.04¼	.04⅜
NEW YORK (Bayonne, N. J.)—				
36-40 (No. 1 grade)	.05½	.05¾	.05½	.06
32-36 (No. 2 grade)	.04¾	.05	.04¾	.05
21 industrial (No. 4 grade)	.04¼	.04½	.04¼	.04½

Gas Oil, Diesel Oil and Fuel Oil

(Gas oil per gallon; Diesel and fuel oils per barrel)

OKLAHOMA (Group 3)—	Mar. 27		Mar. 20	
32-36 gas oil cracking stock	.01⅞	.02⅛	.01⅞	.02⅛
U.G.I. gas oil	.02⅛		.02⅛	
32-36, zero to 15 gas oil	.02⅞	.03	.02⅞	.03
28-30, No. 3 burner oil	1.00	1.05	1.00	1.05
28-30, zero to 10 fuel oil	.95	1.00	.95	1.00
26-30, zero to 10 fuel oil	.85	.95	.85	.95
24-26 fuel oil	.70	.75	.70	.75
20-22 fuel oil	.57½	.65	.57½	.65
Below 16 fuel oil	.55	.60	.55	.60
NORTH TEXAS—				
32-36 gas oil, industrial	.02		.02	
22-26 fuel oil	.57½	.62½	.57½	.62½
Below 20 fuel oil	.47½	.50	.47½	.50
NORTH LOUISIANA (Ark., No. La. & Miss. del.)—				
32-36 gas oil, zero	.03		.03	
14-16 fuel oil	.70		.70	
ARKANSAS (Ark., No. La. & Miss. del.)—				
30-32 gas oil, zero	.02¾		.02¾	
32-36 gas oil	.03		.03	
14-16 fuel oil	.70		.70	
CHICAGO (based on Oklahoma Group 3)—				
32-36 gas oil, industrial	.01⅞	.02	.01⅞	.02
28-30 zero to 10, fuel oil	.95	1.02½	.97½	1.02½
26-28 zero to 10, fuel oil	.85	.90	.85	.90
22-26 zero to 10, fuel oil	.75	.80	.75	.80
18-22 zero to 10, fuel oil	.60	.62½	.60	.65
Below 18 fuel oil	.45	.55	.40	.50

Note: Fuel oils of more than 40 cold test generally 5 to 15 cents per barrel less in all these areas.

PENNSYLVANIA (inland refineries)—				
36-40	.03⅞	.04	.03¾	.03⅞
CALIFORNIA—				
30-34 gas oil per bbl.	.90	1.00	.90	1.00
27 plus Diesel	.90	1.00	.90	1.00
15-19 bunker (at tidewater)	.60	.70	.60	.70
15-19 (cargo lots)	.55	.60	.55	.60
15-19 (tank cars)	.45	.60	.45	.60
GULF COAST—				
28-30 gas oil	.03¼	.03½	.03¼	.03½
28-30 Diesel (bunkers)	1.80		1.80	
Bunker C (bulk cargoes)	.95	1.00	.92½	.95
Bunker C (bunkers)	1.15		1.05	
NEW YORK (Bayonne, N. J.)—				
28 plus, gas oil	.04¼	.04½	.04¼	.04½
28-30 Diesel (lighterage 6½ cents per bbl.)	1.95		1.95	
28-30 Diesel (tank cars)	.04½		.04½	
Bunker C (to ocean-going ships in N. Y. harbor)	1.30		1.20	

*Lighterage charge 5 cents per barrel additional.

Neutral Oils

(Vis. at 100° F. except Pennsylvania, and color N.P.A.)

OKLAHOMA (Group 3)—	Mar. 27		Mar. 20	
Zero to 10 Cold Test:				
150-3	.08		.07¾	.08
180-3	.09¼		.09	.09¼
180-4	.09		.08¾	.09
200-3	.09¾		.09½	.09¾
200-4	.09½		.09¼	.09½
240-3	.11¾		.11½	.11¾
240-4	.11½		.11¼	.11½
280-3	.12¾		.12½	.12¾
280-4	.12¼		.12	.12¼
300-3½	.13½		.13¼	.13½
350-3½	.14½		.14¼	.14½
400-4	.15½		.15¼	.15½
500-4½	.16½		.16¼	.16½
100-2 paraffin oil	.05¾		.05½	.05¾
15-30 Cold Test:				
200-3	.08¾		.08½	.08¾
200-4	.08½		.08¼	.08½
240-3	.10¾		.10½	.10¾
240-4	.10½		.10¼	.10½
280-3	.11¾		.11½	.11¾
280-4	.11½		.11¼	.11½
GULF COAST—				
Pale Oils:				
200-3	.07½		.07½	
300-3	.08	.08¼	.08	.08¼
500-3½	.09	.09¼	.09	.09¼
750-3½	.09¾	.10	.09¾	.10
1,200-3½	.10¼	.10½	.10¼	.10½
2,000-4	.10¾		.10¾	
Red Oils:				
200-5-6	.06½		.06½	
300-5-6	.07	.07¼	.07	.07¼
500-5-6	.08	.08¼	.08	.08¼
750	.08¾	.09	.08¾	.09
1,200-5-6	.09¼	.10	.09¼	.10
2,000-6½ plus	.09¾	.10½	.09¾	.10½
CALIFORNIA—				
Pale Oils:				
100-2½-3	.23	.25	.23	.25
200-2½-3	.23	.25	.23	.25
300-3-3½	.23	.25	.23	.25
350-3-4	.23	.25	.23	.25
400-3-4	.23	.25	.23	.25
450-3-4	.23	.25	.23	.25
550-3-4	.23	.25	.23	.25
600-3-4	.23	.25	.23	.25
Red Oils:				
200-4-5	.23	.25	.23	.25
300-5-6	.23	.25	.23	.25

350-5-6	.23	.25	.23	.25
400-5-6	.23	.25	.23	.25
450-5-6	.23	.25	.23	.25
500-5-6	.23	.25	.23	.25
600-5-6½	.23	.25	.23	.25
700-6½ plus	.23	.25	.23	.25
750-6½ plus	.23	.25	.23	.25
900-6½ plus	.23	.25	.23	.25
PENNSYLVANIA—				
150 vis. at 70° F., 3 color; 400-405 flash:				
Zero pour test	.23½	.24	.23½	.24
10 pour test	.22½	.23	.22½	.23
15 pour test	.22	.22½	.22	.22½
25 pour test	.21	.21½	.21	.21½
180 vis. at 70° F., 3 color:				
25 pour test	.25	.25½	.25	.25½
200 vis. at 70° F., 3 color:				
Zero pour test	.30	.30½	.30	.30½
10 pour test	.28½	.29	.28½	.29
15 pour test	.28	.28½	.28	.28½
25 pour test	.27½	.28	.27½	.28

Bright and Steam Refined Stocks

OKLAHOMA (Group 3)—	Mar. 27		Mar. 20	
Bright Stocks:				
190-200 D	.26½		.26½	
150-160 D, 0-10	.23¾		.23¾	
150-160 D, 10-25	.23¼		.23¼	
150-160 25-40	.22¾		.22¾	
150-160 E	.22¾		.22¾	
Steam refined:				
630 light green (treated)	.15		.15	
600 light green (untreated)	.07	.09	.07	.09
600 dark green (untreated)	.05	.07	.05	.07
PENNSYLVANIA—				
600 S.R.	.18½	.19	.18½	.19
650 S.R.	.21	.21½	.21	.21½
600 Pennsylvania flash	.22	.22½	.22	.22½
630 flash	.26½	.27	.26½	.27
600 Warren E filtered	.21½	.22	.21½	.22
Pennsylvania Grade bright stocks:				
No. 8 color, 145-50 at 210; 540-550 flash:				
10 pour test	.29	.29½	.29	.29½
15 pour test	.28½	.29	.28½	.29
20 pour test	.28	.28½	.28	.28½
25 pour test	.27½	.28	.27½	.28

Wax and Petrolatum

(Prices per pound)

OKLAHOMA (Group 3)—	Mar. 27		Mar. 20	
124-126 white crude scale	.03¾	.03⅞	.03¾	.03⅞
PENNSYLVANIA—				
122-124	.0405		.0405	
124-126	.04⅛		.04⅛	
NEW YORK HARBOR—				
Wax (a.m.p.) in bags fully refined:				
120-122	.0430	.0455	.0430	.0455
123-125	.04¼	.0470	.04¼	.0470
125-127	.0455	.0480	.0455	.0480
130-132	.0405	.0520	.0405	.0520
133-135	.0555	.0580	.0555	.0580
135-137	.0580	.0605	.0580	.0605
124-126 crude scale	.03¾	.04	.03¾	.04
Petrolatum in barrels in carload lots:				
Dark green	.01⅞	.02	.01⅞	.02
Amber	.02⅞	.03	.02⅞	.03
Extra amber	.03⅛	.03¼	.03⅛	.03¼
Lily white	.06¾	.06⅞	.06¾	.06⅞
Snow white	.07¾	.07⅞	.07¾	.07⅞
Cream	.05⅝	.05¾	.05⅝	.05¾
CHICAGO (f.o.b. switching district)*—				
122-124 wax	.0465	.0475	.0465	.0475
125-127 wax	.0490	.0500	.0490	.0500
127-129 wax	.0505	.0515	.0505	.0515
130-132 wax	.0565	.0575	.0565	.0575
132-134 wax	.0590	.0600	.0590	.0600

*Cents per pound on carlot orders in burlap bags of 225 lbs. approx. Add 3° F. a.m.p.

Export Prices

GASOLINE

GULF COAST—	Mar. 27	Mar. 20
U. S. Motor	.04½	.04½ .04⅝
60-62 400	.04⅝	.04⅝ .04¾
61-63 390	.04¾ .04⅞	.04⅞
64-66 375	.05	.05
LOS ANGELES, CALIF.—		
U. S. Motor grades:		
53-55 octane	.04 .04¼	.04 .04¼
55-65 octane	.04¼ .04½	.04¼ .04½
65-67 octane	.04½ .04¾	.04½ .04¾
67-69 octane	.04¾ .05	.04¾ .05
Above 69 octane	.05 .05¼	.05 .05¼
58-60 400 endpoint	.04¾ .05½	.04¾ .05½

KEROSENE

GULF COAST—				
41-43 prime white	.04⅛	.04¼	.04⅛	.04¼
41-43 water white	.04¼	.04⅜	.04¼	.04⅜
44 water white	.04⅜	.04½	.04⅜	.04½
LOS ANGELES, CALIF.—				
41-43 water white	.04¼	.04½	.04¼	.04½

LUBRICANTS

NEW YORK (f.a.s. in bbls.)—				
Cylinder Stocks:				
600 Warren E	.28	.29	.28	.29
600 S.R. unfiltered	.26	.26½	.26	.26½
650 S.R. unfiltered	.28	.28½	.28	.28½
600 flash S.R.	.29	.29½	.29	.29½
630 flash S.R.	.33	.33½	.33	.33½
Bright stock, 8 color	.34½	.35½	.34½	.35½
Bright stock, 6½ plus, dil	.33	.34	.33	.34

NEUTRAL OILS

200-3 color	.34	.35	.34	.35
150-3 color	.29	.30	.29	.30

PARAFFIN WAX (Fully Refined)

NEW YORK (prices per pound)—				
120-122 a.m.p.	.04¼	.04½	.04¼	.04½
123-125 a.m.p.	.0420	.0465	.0420	.0465
125-127 a.m.p.	.04½	.04¾	.04½	.04¾
130-132 a.m.p.	.0490	.0515	.0490	.0515
133-135 a.m.p.	.05½	.05¾	.05½	.05¾
135-137 a.m.p.	.05¾	.06	.05¾	.06

Crude Oil Gravity Table

Degrees gravity—	1 Oklahoma and Kansas	2 North Texas, Central Texas and East Central Texas	3 North Louisiana and Arkansas	4 Gray County, Texas	5 Carson, Hutchinson, and Moore Counties, Texas	6 Conroe, Texas	7 Salt Creek, Wyo.	8 Gulf Coast, Texas, and Louisiana	9 Gulf Coast, Texas, and Louisiana	10 Cotton Valley, Louisiana
Below 20	....	....	....	....	....	....	....	$.82	$.82	....
20-20.9	....	....	....	....	....	....	....	.84	.84	....
21-21.9	....	....	....	....	....	....	....	.86	.86	....
22-22.9	....	....	....	....	....	....	....	.88	.88	....
23-23.9	....	....	....	....	....	....	....	.90	.90	....
24-24.9	....	....	....	....	....	....	....	.92	.92	....
Below 25	*$.76	....	....	....	....	....	....	....	....	$.70
25-25.9	*.78	....	....	....	....	....	....	.94	.94	.72
26-26.9	*.80	....	....	....	....	....	....	.96	.96	.74
27-27.9	*.82	....	....	....	....	....	....	.98	.98	.76
28-28.9	*.84	....	....	....	....	....	....	1.00	1.00	.78
Below 29	.84	$.79	$.79	....	....	....	$.84	....	....	....
29-29.9	.86	.81	.81	....	....	....	.86	1.02	1.02	.80
30-30.9	.88	.83	.83	....	....	....	.88	1.04	1.04	.82
31-31.9	.90	.85	.85	....	....	....	.90	1.06	1.05	.84
32-32.9	.92	.87	.87	....	....	....	.92	1.08	1.06	.86
33-33.9	.94	.89	.89	....	....	....	.94	1.10	1.07	.88
34-34.9	.96	.91	.91	....	....	....	.96	1.12	1.08	.90
Below 35	....	....	....	$.79	$.69	....	....	....	....	....
35-35.9	.98	.93	.93	.81	.71	$1.09	.98	1.12	1.09	.92
36-36.9	1.00	.95	.95	.83	.73	1.11	1.00	1.12	1.10	.94
37-37.9	1.02	.97	.97	.85	.75	1.13	1.02	1.12	1.11	.96
38-38.9	1.04	.99	.99	.87	.77	1.15	1.04	1.12	1.12	.98
39-39.9	1.06	1.01	1.01	.89	.79	1.17	1.06	1.12	1.13	1.00
40 and over	1.08	1.03	1.03	.91	.81	1.19	1.08	1.12	1.14	1.02

*The following companies purchasing crude oil in Kansas or Oklahoma, or both, begin their price schedules: Below 25 degrees, 76 cents; 25-25.9 degrees, 78 cents, with 2 cents added for each degree upward to 40 and over at $1.08: Carter Oil Co., Magnolia Petroleum Co., Pure Oil Co., Rock Island Refining Co., Shell Petroleum Corp., Sinclair Prairie Oil Marketing Co., Skelly Oil Co., and Wilcox Oil & Gas Co. All others begin their schedule at below 26 degrees, 84 cents, excepting Phillex Oil Co., which begins with below 31 degrees at 88 cents.

Column 1—Effective September 29, Texas Co. in Oklahoma; Stanolind Crude Oil Purchasing Co. in Kansas and Oklahoma; Anderson & Prichard, Inc., in Oklahoma; Bell Oil & Gas Co. in Oklahoma; Carter Oil Co. in Oklahoma and Kansas; Deep Rock Oil Co. in Oklahoma; Derby Oil Co. in Kansas; Globe Refining Co. in Oklahoma; Golden Rule Refining Co. in Kansas; Gypsy Oil Co. in Oklahoma and Kansas; Kanotex Refining Co. in Kansas; Magnolia Petroleum Co. in Oklahoma; Mid-Continent Petroleum Corp. in Oklahoma; National Refining Co. in Kansas and Oklahoma; Shell Petroleum Corp. in Kansas and Oklahoma; Sinclair Prairie Oil Marketing Co. in Kansas and Oklahoma; Texas Co. in Oklahoma; Tide Water Oil Co. in Oklahoma; Vickers Refining Co. in Kansas; Continental Oil Co. in Kansas and Oklahoma; Empire Pipe Line Co. in Oklahoma and Kansas; Phillex Oil Co. in Kansas and Oklahoma; Pure Oil Co. in Oklahoma; Skelly Oil Co. in Kansas. Effective September 29, by White Eagle Oil Corp. in Kansas; on October 1 by Barnsdall Refineries, Inc., in Oklahoma.

Column 2—Effective September 29, by Texas Co., Stanolind Crude Oil Purchasing Co., Humble Oil & Refining Co., Sinclair Prairie Oil Marketing Co., Gulf Pipe Line Co., Magnolia Petroleum Co., Bell Oil & Gas Co., Continental Oil Co. Effective September 29, in the Van Pool, Van Zandt County, Pure Oil Co. posted below 29 degrees, 84 cents, with 2 cents added for each degree up to 40 and over at $1.08.

Column 3—Effective September 29, by Texas Co., Magnolia Petroleum Co., Gulf Refining Co. Effective December 22, Stanolind Oil & Gas Co. in Pine Island, Louisiana, and Marion County, Texas, posted below 29 degrees, 79 cents, with 2 cents added for each degree up to 40 and over at $1.03. Effective March 17, 1934, by Standard Oil Co. of Louisiana and Louisiana Oil Refining Co. Starting with below 25 degrees, 71 cents, adding 2 cents for each degree upward to 40 and over at $1.03.

Column 4—Effective September 29, by Texas Co., Humble Oil & Refining Co., Magnolia Petroleum Co., Sinclair Prairie Oil Marketing Co., and H. F. Wilcox Oil & Gas Co. On same day Phillex Oil Co. posted below 31 degrees, 71 cents, with 2 cents added for each degree up to 40 and over at 91 cents.

Column 5—Effective September 29, by Texas Co., Humble Oil & Refining Co., Gulf Pipe Line Co., Magnolia Petroleum Co., Wilcox Oil & Gas Co., Continental Oil Co. On same day, Phillex Oil Co. posted below 31 degrees, 61 cents, with 2 cents added for each degree upward to 40 and over at 81 cents.

Column 6—Effective September 29, by Humble Oil & Refining Co. and Tide Water Oil Co., and on September 30, by Texas Co. which on September 29 had posted a schedule of $1.07 to $1.12 with a 1-cent spread on each degree.

Column 7—Effective September 29 by Stanolind Oil & Gas Co.

Column 8—Effective September 29, by Humble Oil & Refining Co., Gulf Pipe Line Co., Shell Petroleum Corp., Pure Oil Co., Sinclair Prairie Oil Marketing Co. On October 2, Magnolia Petroleum Co. posted Lockport, Louisiana: 30-30.9 degrees, 84 cents, with 2 cents added for each degree upward to 34 and over at $1.12, and in Cameron Meadows and Iowa, Louisiana: Below 20 degrees, 72 cents with 2 cents added for each degree up to 34 and over at $1.02. These prices were 2 cents higher on each degree than Magnolia prices posted on September 29. Effective September 29, Shell Petroleum Corp. posted in Iowa, Louisiana, district: Below 20 degrees, 70 cents, with 2 cents added for each degree upward to 34 degrees and over at $1; and in Black Bayou and White Castle, Louisiana: Below 20 degrees, 80 cents, with 2 cents added for each degree upward to 34 degrees and over at $1.10.

Column 9—Effective September 30, Texas Co. (On September 29, Texas Co. had posted a schedule 2 cents lower on each degree, but changed it on September 30.)

Column 10—Effective September 29, by Louisiana Oil Refining Co.

(California Crude Oil Prices on Page 117)

Crude Oil Prices

Oklahoma, Kansas, North Central and East Central Texas

East Texas	$1.00
Stratman, Kans. (Sept. 29, 1933)	1.03
Corsicana (heavy) (June 17, 1933)*	.30
Other fields	(See gravity table)

Note—In East Texas, effective September 29, 1933, by Texas Co., Stanolind Crude Oil Purchasing Co., Humble Oil & Refining Co., Shell Petroleum Corp., Gulf Pipe Line Co., Tide Water Oil Co., Sinclair Prairie Oil Marketing Co., Magnolia Petroleum Co., Sun Oil Co., Panola Pipe Line Co., and Empire Oil & Refining Co.
*Magnolia Petroleum Co.

West Texas

Crane, Upton, Crockett, Howard, Glasscock, Mitchell (Sept. 29, 1933)	$ .70
Ector, Winkler and Pecos Counties and Lea County, New Mexico (Sept. 29, 1933)	.75
Pecos County, Yates shallow pool (Sept. 29, 1933)*	.65
Jones and Fisher Counties.	See gravity table.

Note—Effective September 29, 1933, by Humble Oil & Refining Co., Texas Co., Gulf Pipe Line Co., Shell Petroleum Corp., Magnolia Petroleum Co., and by Stanolind Oil & Gas Co. in Winkler County, Texas.
*Shell Petroleum Corp.

Gulf Coast

Grade A and Grade B specifications discontinued by leading buyers	(See gravity table)
Tomball (see note)*	$1.15
Livingston (Sept. 29, 1933)†	1.00
Cleveland (Jan. 11, 1934)	1.00
Greta (Sept. 29, 1933)	.85
Refugio, light	(See gravity table)
Refugio, heavy (Sept. 29, 1933)‡	.85
Markham and High Island	(See Gulf Coast gravity table)
Conroe	(See Conroe gravity table)

Note—Tomball, effective September 29, by Humble Oil & Refining Co., and October 2 by Magnolia Petroleum Co., and November 10 by Stanolind Oil & Gas Co.
*Greta posted by Texas Co. †Shell Petroleum Corp. ‡Refugio heavy, by Humble Oil & Refining Co. Cleveland (Liberty County), posted by Magnolia Petroleum Co.

South Central and Southwest Texas

(See note below table)

Darst Creek	$.87
Mirando	.80
Luling (Sept. 29, 1933)	.75
Pettus	1.05
Salt Flat	.87
Lytton Springs (Sept. 29, 1933)	.95
Duval County (Sept. 29, 1933)	.80
Saxet	.85

Note—Effective on September 29 by Humble Oil & Refining Co., in Darst Creek, Mirando, Pettus, Salt Flat and Saxet. Effective September 29 in Darst Creek by Gulf Pipe Line Co. and Texas Co. Effective October 2 by Magnolia Petroleum Co. Effective in Pettus and Salt Flat on September 29 by Humble Oil & Refining Co. and Gulf Pipe Line Co. Luling and Lytton Springs by Magnolia Petroleum Co. Duval County by Texas Co. Saxet, effective September 29, by Humble Oil & Refining Co. and Texas Co.

(Continued on Page 117)

TANK WAGON MARKETS

Quotations for gasoline and kerosene in United States, as furnished by the larger marketing concerns, include taxes

March 27, 1934

Taxes

The gasoline quotations given in the following tables include the 1 cent Federal tax, as well as state, county and city taxes. The gasoline quoted is the regular or standard grade. In most marketing areas a third grade and a premium grade are also available.

Discounts

Under the standard form of commercial consumer contract which went into effect March 1, 1934, save in California, Oregon, Washington, Arizona and Nevada, a discount of 1 cent a gallon off tank wagon, or 3 cents a gallon off retail prices, is permitted for purchases running between 3,000 and 10,000 gallons a month, and 2 cents a gallon off tank wagon, or 4 cents a gallon off retail prices, for purchases in lots of more than 10,000 gallons a month. The minimum delivery is 25 gallons.

Rocky Mountain District

CONTINENTAL OIL CO.

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Denver, Colo.	18.0	20.0	6.0	10.0
Pueblo	16.0	18.0	6.0	13.0
Grand Junction	22.0	24.0	6.0	15.0
Casper, Wyo.	19.5	21.5	5.0	11.5
Cheyenne	18.0	20.0	5.0	13.0
Butte, Mont.	21.0	23.0	5.0	17.5
Billings	23.0	25.0	6.0	16.5
Helena	22.5	24.5	6.0	17.5
Great Falls	22.5	24.5	6.0	17.5
Salt Lake, Utah	22.0	24.0	5.0	16.0
Boise, Idaho	23.0	25.0	6.0	18.0
Twin Falls	23.0	25.0	6.0	18.0
Albu'que, N. M.	20.0	22.0	*7.0	13.0

*One-cent city tax.

Effective March 1, 1934, discount to dealers with or without contract throughout Continental territory: Undivided dealer discount off service station price, 4 cents; divided dealer accounts, 3½ cents.

Standard Oil Co. (Indiana)

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Chicago	16.3	18.3	4.0	9.7
Decatur, Ill.	16.7	18.7	4.0	10.2
E. St. Louis	16.0	18.0	4.0	9.5
Joliet	16.7	18.7	4.0	10.2
Peoria	16.7	16.7	4.0	10.2
Quincy	16.6	18.6	4.0	10.0
Davenport Ia.	16.6	18.6	4.0	10.1
Des Moines	16.6	18.6	4.0	8.0
Mason City	16.6	18.6	4.0	10.1
Sioux City	16.2	18.2	4.0	9.7
Duluth, Minn.	17.2	19.2	4.0	10.4
Mankato	16.8	18.8	4.0	9.3
Minneapolis	16.9	18.9	4.0	10.4
LaCrosse, Wis.	18.3	20.3	4.8	10.8
Green Bay	17.7	19.7	5.0	10.2
Milwaukee	17.1	19.1	5.0	9.7
Madison	17.4	19.4	5.0	9.9
Detroit, Mich.	17.0	19.0	4.0	8.5
Grand Rapids	16.7	18.7	4.0	10.2
Saginaw	17.0	19.0	4.0	10.5
Evansville, Ind.	17.7	19.7	5.0	10.0
Indianapolis	17.9	19.9	5.0	10.2
South Bend	18.3	20.3	5.0	10.6
Fargo, N. Dak.	17.9	19.9	4.0	13.1
Huron, S. Dak.	18.8	20.8	5.0	11.4
Sioux Falls	18.4	20.4	5.0	10.9
K. C., Mo.*	15.7	17.7	4.0	8.2
Springfield	15.1	17.1	3.5	9.1
St. Louis	15.0	17.0	3.5	7.5
St. Joseph*	15.3	17.3	4.0	8.3
Wichita, Kans.	14.6	16.6	4.0	8.1
Bartlesville, Ok.	16.0	18.5	5.0	8.5

*State tax 2 cents, 1-cent city tax and 1-cent Federal tax.

Discounts to dealers, effective March 1, 1934: Undivided accounts, 4 cents a gallon on Red Crown Ethyl and Standard Red Crown, divided accounts, 3½ cents a gallon on Red Crown Ethyl and Standard Red Crown.

Stanolex Furnace Oil in Chicago

Effective March 5, 1934, prices f.o.b. Chicago, tank wagon prices: No. 1 (36-40 lt. stw. zero), under 100 gallons, 8¼ cents; No. 2 (30-34 stw. zero), 7⅞ cents; No. 3 (22-26 zero), 7¼ cents; No. 4 under 300 gallons (12-16 zero), 5⅝ cents; viscosity of No. 4, 90-115 at 100° F.; No. 5 under 300 gallons, 5⅛ cents; for deliveries of 100 gallons or more deduct 1 cent.

Naphtha

	Tank wagon*
Oleum spirits	13.9
V.M.&P. naphtha	15.9
Cleaners' naphtha	15.0
Stanisol	15.0

*Exclusive of 3-cent state and 1-cent Federal taxes, effective March 24.

Prices f.o.b. Chicago, September 13, 1933. Each of above prices subject to discount of 1 cent per gallon for 150-gallon lots if covered by contracts.

Southern District

STANDARD OIL CO. (KENTUCKY)

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Atlanta, Ga.	18.0	20.0	7.0	13.0
Augusta	19.0	21.0	7.0	14.0
Macon	19.5	21.5	7.0	14.0
Savannah	19.5	21.5	7.0	14.0
Birm'ham, Ala.	21.5	23.5	8.0	14.0
Mobile	20.5	22.5	8.0	14.0
Montgomery	19.0	21.0	8.0	15.0
Jackson, Miss.	18.5	20.5	7.0	14.0
Vicksburg	18.0	20.0	7.0	14.0
Jack'ville, Fla.	19.5	21.5	8.0	11.5
Miami	19.5	21.5	8.0	13.5
Pensacola	19.5	21.5	8.0	13.5
Tampa	19.5	21.5	8.0	12.5
Lexington, Ky.	15.5	17.5	6.0	11.5
Covington	17.5	19.5	6.0	11.5
Louisville	17.5	19.5	6.0	11.5
Paducah	16.0	18.0	6.0	11.5

In addition to the state tax of 4 cents on gasoline, Montgomery has city and county tax of 2 cents on gasoline and one-half cent on kerosene. Kerosene prices in Georgia and Mississippi include 1 cent state tax; in Alabama, an inspection fee of one-half cent on kerosene and one-fortieth cent on gasoline; in Florida an inspection fee of one-eighth cent on kerosene and gasoline. To Pensacola, Mobile and Birmingham state taxes on gasoline add 1 cent city tax.

Southwestern District

MAGNOLIA PETROLEUM CO.

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Dallas, Tex.	17.0	19.0	5.0	6.0
Fort Worth	17.0	19.0	5.0	6.0
Houston	15.0	17.0	5.0	8.5
San Antonio	17.0	19.0	5.0	8.5
El Paso	17.5	19.5	5.0	11.0
Muskogee, Ok.	16.0	18.0	5.0	8.5
Okla. City	16.0	18.0	5.0	8.5
Tulsa	16.0	18.0	5.0	8.5
Ft. Smith, Ark.	14.5	16.5	5.0	8.0
Little Rock	16.5	18.5	7.5	9.0
Texarkana	15.0	17.0	5.0	8.5

Atlantic Coast District

STANDARD OIL CO. OF NEW JERSEY

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Atl'tic City, N.J.	17.5	16.0	4.0	10.0
Newark	16.8	16.3	4.0	9.5
Annapolis, Md.	18.1	17.6	5.0	10.0
Baltimore	17.6	17.1	5.0	10.0
Cumberland	19.1	18.5	5.0	12.7
Wash'g'n, D. C.	15.8	15.3	3.0	11.5
Danville, Va.	20.2	19.7	6.0	12.5
Norfolk	18.7	14.5	6.0	11.3
Petersburg	19.5	19.0	6.0	11.4
Richmond	19.1	15.6	6.0	11.7
Roanoke	20.3	15.9	6.0	12.9
Charls'n, W.Va.	18.5	18.0	5.0	12.6
Parkersburg	17.8	17.3	5.0	11.2
Wheeling	18.5	18.0	5.0	12.2
Charlotte, N. C.	21.9	21.0	7.0	13.5
Hickory	22.2	19.0	7.0	13.7
Mt. Airy	22.2	21.7	7.0	13.8
Raleigh	21.7	21.0	7.0	13.3
Salisbury	22.0	21.5	7.0	13.6
Charleston, S.C.	19.7	19.2	7.0	11.3
Columbia	21.5	21.0	7.0	13.2
Spartanburg	21.9	21.0	7.0	13.5

Note—Dealer contracts are written at 2½ cents above the posted tank car price, less a voluntary allowance of one-half cent per gallon. This affects all points. Kerosene 1 cent off tank wagon for 25 gallons or more under contract except New Jersey and Baltimore, Md.

Ohio

STANDARD OIL CO. OF OHIO

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Ohio points	16.5	17.5	5.0	*12.5

*Includes state tax of 1 cent, effective July 22

Nebraska

STANDARD OIL CO. OF NEBRASKA

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Omaha	17.3	19.3	5.0	9.0
McCook	18.4	18.4	5.0	8.0
Norfolk	17.8	19.8	6.0	8.5
North Platte	18.8	20.8	5.0	9.0
Scottsbluff	18.8	19.3	5.0	11.0

Note: Discount to dealers, including any rentals under lease and agency agreements: Undivided accounts, Standard Red Crown and Red Crown Ethyl Gasoline 4 cents, Reliance (third brand) 3 cents, under service station price. Divided accounts, Standard Red Crown Ethyl Gasoline 3½ cents, Reliance (third brand) 2½ cents, under service station price. Discounts to consumers covered only by form CD-1, official commercial consumer contract.

Central South District

STANDARD OIL CO. OF LOUISIANA

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
N. Orleans, La.	19.3	18.5	*7.0	†12.0
Baton Rouge	18.7	18.2	6.0	†12.0
Alexandria	19.6	19.1	*7.0	†10.0
Lafayette	19.8	19.3	*7.0	†12.0
Lake Charles	19.7	19.2	*7.0	†12.0
Shreveport	17.5	15.5	6.0	†12.0
Knoxville, Tenn.	23.2	22.7	8.0	13.0
Memphis	21.6	21.0	8.0	9.5
Chattanooga	23.0	22.5	8.0	11.0
Nashville	22.4	16.5	8.0	11.0
Bristol	23.0	20.2	8.0	14.0

*Includes city tax of 1 cent. †Louisiana kerosene prices include 1-cent state tax.

Commercial consumers for tank wagon delivery pay following amounts over tank car price, basis yearly deliveries:

1,000 to 75,000 gallons	2.5
75,000 to 300,000 gallons	1.5
Over 300,000 gallons	1.0

Pacific Coast Territory

STANDARD OIL CO. OF CALIFORNIA*

	Gasoline: Tank wagon†	Gasoline: Posted retail	Gasoline: Incl'ds tax of	Kero. tank wagon
San Francisco	12.0	15.0	4.0	12.5
Los Angeles	10.0	13.0	4.0	12.5
Fresno, Calif.	12.0	15.0	4.0	14.0
Phoenix, Ariz.	18.5	21.5	6.0	‡16.0
Reno, Nev.	20.0	23.0	5.0	15.5
Portland, Ore.	19.0	22.0	5.0	13.5
Seattle, Wash.	15.0	18.0	6.0	13.5
Tacoma	15.0	18.0	6.0	13.5
Spokane	21.0	24.0	6.0	18.0

*Retail prices posted by Standard Stations, Inc., a subsidiary.

†Prices are at company's plant or depots, as company does not operate stations. A 4-cent per gallon discount is given dealers and customers taking tank wagon lots except in Phoenix where the discount is 1 cent.

‡Includes 5 cents state tax.

Pennsylvania, Delaware and Part of New England

ATLANTIC REFINING CO.

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Philadelphia, Pa.	16.0	16.5	4.0	10.0
Pittsburgh	16.5	17.5	4.0	10.0
Allentown	16.5	17.5	4.0	10.0
Erie	16.5	17.5	4.0	10.0
Scranton	16.5	17.5	4.0	10.0
Altoona	16.5	17.5	4.0	10.0
Dover, Del.	16.5	17.5	4.0	10.0
Wilmington	16.5	17.0	4.0	10.0
Boston, Mass.	16.0	17.0	4.0	8.5
Springfield	16.6	17.6	4.0	8.5
Worcester	16.5	17.5	4.0	9.0
Hartford, Conn.	15.4	16.4	3.0	9.0
New Haven	15.2	16.2	3.0	9.0
Providence, R.I.	14.5	16.5	3.0	8.5

New York and Part of New England

STANDARD OIL CO. OF NEW YORK

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Albany, N. Y.	16.1	17.1	4.0	9.0
Met. New York	14.5	15.5	4.0	9.0
Buffalo	16.5	17.5	4.0	8.5
Rochester	16.5	17.5	4.0	8.5
Syracuse	16.5	17.5	4.0	9.0
Boston, Mass.	16.0	17.0	4.0	8.5
Portland, Me.	17.2	18.2	5.0	8.5
Manch't'r, N.H.	18.2	19.2	5.0	9.0
Burlington, Vt.	18.8	19.8	5.0	9.5

Canada*

IMPERIAL OIL, LTD.

Imperial 3-Star Gasoline

	Gasoline: Tank wagon	Gasoline: Service station	Gasoline: Incl'ds tax of	Kero. tank wagon
Hamilton, Ont.†	26.5	27.5	6.0	17.5
Toronto, Ont.†	26.5	27.5	6.0	17.5
Brandon, Man.*	31.0	34.5	7.0	22.5
Winnipeg, Man.	28.7	31.7	7.0	20.2
Regina, Sask.	29.0	32.0	6.0	21.5
Saskatoon, Sask.	31.8	34.8	6.0	24.3
Edmonton, Alta.	31.2	34.2	6.0	23.7
Calgary, Alta.	28.5	31.5	6.0	21.0
Vanc'ver, B.C.†	30.0	33.0	7.0	24.0
Montreal, Que.	24.0	27.0	6.0	17.0
St. Johns, N.B.	26.5	30.5	7.0	21.0
Halifax, N. S.	25.5	29.5	6.0	21.0

*Imperial gallon used in Canada. †Dealer discount posted tank wagon on gasoline in Ontario and British Columbia subject to dealer's discount of 3 cents per gallon.

Retail Price Changes

Regular-Grade Gasoline and Kerosene

Standard Oil Co. of New Jersey, March 10, reduced service station price of gasoline in Atlantic City 1 cent. March 14, advanced service station price in Roanoke 3.8 cents; March 16, reduced it 1.4 cents; March 18, reduced it 1 cent further; March 19, reduced it 1 cent further; March 21, reduced it one-half cent further. March 16, reduced service station price in Norfolk one-half cent; March 18, reduced it one-half cent further. March 16, reduced service station price in Richmond 1 cent; March 17, reduced it one-half cent further; March 18, reduced it one-half cent further; March 19, reduced it one-half cent further; March 20, reduced it one-half cent further. March 8, advanced service station price in Salisbury 4½ cents.

Standard Oil Co. (Nebraska), March 13, reduced tank wagon price of kerosene in Norfolk 2.8 cents.

Standard Oil Co. of Louisiana, March 16, advanced service station price of gasoline 1.6 cents in Alexandria. March 14, reduced service station price in Nashville 1 cent. March 17, reduced service station price .9 cent in Bristol.

Standard Oil Co. of California, March 16, reduced tank wagon and service station prices of gasoline 2 cents in Seattle and Tacoma and 1 cent in Spokane. March 20, reduced tank wagon and service station prices 2 cents further in Seattle and Tacoma. March 22, reduced service station and tank wagon price in San Francisco 2½ cents.

Standard Oil Co. of New York, Inc., March 23, reduced tank wagon and service station prices of regular grade gasoline 1½ cents in Manhattan, Bronx, Brooklyn, Queens, Nassau and Suffolk Counties; on same date reduced service station price of third-grade 1 cent, making spread of 1 cent between regular and third grades. March 23, reduced tank wagon and service station prices of regular grade .2 cent in Buffalo and .1 cent in Syracuse.

Magnolia Petroleum Co., February 10, reduced tank wagon price of kerosene 2½ cents. February 13, reduced price of kerosene 2½ cents in Fort Worth.

Gasoline to New Lows in the Group 3 Market

(Continued from Page 24)

own recovery plant to refrain from throwing his product into the market at a time when it already is glutted with the material which must be produced daily at the natural gasoline plant.

"It is evident," said Mr. Scherer, "that remedial measures must be taken from the very fact that 10 to 12-pound natural gasoline with an octane value of 65, equivalent to the middle octane motor gasoline, is available today to both the refiner and the jobber at less than the per barrel posted price of crude oil at the well."

There was fair demand for kerosene, though not enough to warrant some of the talk about a strong market. On the contrary there were signs of softness. Prices, however, underwent no change.

Demand for heating oils showed symptoms of weakening, but quotations kept their hold. Neutrals and bright and cylinder stocks were steady. A slight easing in the demand for wax was noticeable, but prices were firm.

ASK PWA LOAN

The city manager of Minot, N. Dak., has been empowered to request a $1,523,000 loan from the Public Works Administration to construct a pipe line to bring natural gas from the Montana-Dakota Power Co.'s line at Williston to Minot.

NEWS FOR SALES DEPARTMENTS

Tide Water Indicator Detects Oil Dilution

NEW YORK, Mar. 23.—The Tide Water Oil Co. in a newspaper advertising campaign inaugurated this week is telling the motorists of the eastern states of a "secret indicator" which protects their customers from substitution in the purchase of their gasolines. It is explained that the company's research and development department over a period of a year has been trying out this indicator and has determined "that it is an accurate, prompt and infallible indicator" that another gasoline is not being substituted for its grade of gasoline.

Before shipment from the refinery at Bayonne, N. J., the company's branded grade of gasoline is given a chemical treatment termed an "identifier." After this gasoline reaches the filling station an investigator calls at the station and obtains a sample in a 4-ounce bottle. The bottle is filled within 1 inch of the top. Then a small vial containing the exact amount of developer is poured into the gasoline and the mixture is thoroughly shaken for one minute.

On standing for a few seconds only, a purplish pink layer will be seen to settle at the bottom of the bottle. This always occurs and the color is the same intensity if the gasoline is a 100 per cent Tide Water product. The color is fainter if any dilution has taken place, depending upon the amount of the dilution, and there is no color whatever in gasolines which do not contain this indicator. The chemical is harmless and cannot cause motor trouble of any kind. The Tide Water company has worked out a systematic method of testing, which will give the company a constant check on the purity of the gasolines sold through its stations.

MOTOR FUEL DEFINED

CHICAGO, Mar. 28.—The Illinois department of finance has defined "motor fuel" for tax purposes, effective March 21, 1934, to include all volatile and inflammable liquids which have:

Flashpoint of less than 100° F. when tested in the Tagliabue closed cup, or

An initial boiling point of under 300° F. when distilled according to the American Society for Testing Materials—Method D-86, or

A 25 per cent recovery temperature of under 392° F., or

A 90 per cent recovery temperature of under 450° F.

These specifications are applicable to, but are not limited to gasoline, naphtha, benzene, casinghead or natural gasoline and benzol. In addition to the above, any other volatile and inflammable liquid when sold or used to propel a motor vehicle on the highways shall be "motor fuel."

The term "motor fuel" shall not include liquefied gases, such as propane or butane, or mixtures of the same, which have Reid vapor pressure in excess of 50 pounds per square inch at 100° F., except when sold or used to propel a motor vehicle on the highways.

GLASS AND STEEL STATION

The Shell Eastern Petroleum Products Co., Inc., has let a contract for what is said to be the first glass gasoline station. The construction will be entirely of steel and glass. The plot of ground on which the completed station will stand is a triangle formed by the intersections of Morningside and St. Nicholas Avenues, 124th and 123rd Streets, New York City. The building will thus be free on all sides. It will be octagonal in shape and 2½ stories high.

SO NOW THEY CALL THE STREET CUTTHROAT ROW

HUTCHINSON, Kans., Mar. 26. Gasoline provides the chief business of South Hutchinson, a community of some 675 population, just across the Arkansas River from here. It has one of the world's largest salt plants, but it is gasoline after all that gives the place distinction.

On Kansas Avenue, the main thoroughfare, there are 15 business establishments and 11 of these sell gasoline. The street frequently is referred to as "Cutthroat Row" because of the price wars staged there.

Pennsylvania Oil Jobbers Plan to Form Association

HARRISBURG, Pa., Mar. 26.—At a meeting of Pennsylvania oil jobbers held in the Penn-Harris Hotel here at the suggestion of Paul E. Hadlick, secretary and counsel for the National Oil Marketers Association, Washington, D. C., plans were formulated for the organization of oil jobbers of this State.

A committee was selected to make further plans for the organization and to arrange for another meeting to be held here April 5. All oil jobbers in Pennsylvania are invited to attend this meeting.

Clarence Schock, Schock Independent Oil Co., Mount Joy, Pa., was elected temporary chairman of the group and he is in charge of arrangements for the April 5 meeting. Other Pennsylvania dealers on the arrangements committee are: P. H. Erdman, Red Arrow Oil Co., Pottstown; Charles P. Harvey, St. Marys; Walter J. Helm, Montour Auto Service Co., Montoursville; J. R. Hewitt, Griffin Oil Co., Glassport; W. C. Hidley, Hidley Oil Co., Bloomsburg; William R. Morell, Pennsylvania-Indiana Oil Co., Allentown; C. S. Price, United Oil & Gas Co., Mount Union; L. A. Purvis, Crystal Oil & Gas Co., Johnstown; C. S. Reese, Audenried Service Station, Audenried; Henry B. Van Dyne, Van Dyne Oil Co., Troy; C. O. Walgram, Beyer & Fortner, Inc., Lewisburg; D. Wollner, Juanita Valley Gas & Oil Co., Lewiston.

The same men, all members of the National Oil Marketers Association, will also constitute a membership campaign committee in a drive for members in the National Oil Marketers Association.

Large Increase Over 1933 Found in Canadian Imports

OTTAWA, Canada, Mar. 19.—Official figures just issued show that imports of petroleum, asphalt and their products into Canada during January were valued at $2,191,043, compared with $2,797,862 in December, and $1,433,320 in January, 1933. The January, 1934, imports were obtained as follows: United States, 78.3 per cent; Peru, 15.6 per cent; Colombia, 5.4 per cent, with the remainder scattered.

Crude petroleum imports into Canada during January totaled 57,602,568 gallons as follows: United States, 43,568,722; Peru, 8,308,726; Colombia, 5,725,120.

Petroleum and its products exported from Canada in January were valued at $71,171. In December the export valuation was $82,670 and in January, 1933, it was $51,815.

Planes Increase Miles and Use Much Gasoline and Oil

WASHINGTON, D. C., Mar. 26.—Increases in mileage and in number of passengers carried, with large consumption of gasoline and lubricating oil, were recorded by American-operated airlines (domestic and foreign extensions) in 1933, according to figures released by the Department of Commerce. They carried 568,940 passengers during 1933, compared with 540,681 in 1932. Air express rose appreciably, but air mail was slightly less than in 1932.

There were 504 airplanes in operation on scheduled airlines at the end of the year. These craft consumed 26,326,796 gallons of gasoline and 924,411 gallons of oil during 1933. The airlines furnished employment for 6,273 persons, including 543 pilots, 206 copilots, 2,320 mechanics and ground crew men; 1,854 other hangar and field personnel; 1,370 operation and office personnel.

Comparison of operations by American-operated airlines (domestic and foreign extensions) in the calendar years 1933 and 1932 follow:

	1933	1932
Domestic		
Miles flown	48,771,553	45,606,354
Passengers carried	493,141	474,279
Passenger mi. flown	173,492,119	127,038,798
Foreign Extensions		
Miles flown	5,870,992	5,326,613
Passengers carried	75,799	66,402
Passenger mi. flown	25,307,960	19,513,789
Domestic and Foreign Extensions		
Miles flown	54,642,545	50,932,967
Passengers carried	568,940	540,681
Passenger mi. flown	198,800,079	146,552,587

Air passengers were paying for transporation at an average of 6.1 cents a mile on domestic airlines at the close of 1933, the report states. They made flights averaging 367 miles in length. The domestic lines had 102,544 flights scheduled during the year and completed 97,978, fulfilling 95 per cent of their schedules.

CITIES SERVICE POWER PROVER

Two demonstration cars to show the presence and dangers of carbon monoxide gas will shortly start on a nation wide trip under the auspices of the Cities Service Oil Co.

Under the auspices of police and health officials in many cities and states, tests will be conducted to learn the efficiency of the average car under various traffic and climatic conditions. The quantity of carbon monoxide found on the country's leading highways and in the interior of cars also will be recorded and studied.

On the tours to be made by the demonstration cars, motorists, service station attendants, civic organizations and other groups will hear lectures on the history, future, construction, operation and adjustment of the motor car. Following the lectures, cars will be tested and adjusted to show the motorist just how to avoid waste of power, oil and gasoline.

The cars have screens for the protection of illustrations and are equipped with valuable scientific instruments, including the company's exclusive power prover, which accurately measures motor efficiency and detects those faults which cause the production of carbon monoxide in dangerous quantities.

TEXAS CO. TO BUILD DOCKAGE

EAST CHICAGO, Ind., Mar. 26.—The Texas Co. has purchased five acres of land on the Indiana Harbor Canal at Canal Street here and will begin construction of 500 feet of docks, officials said. Gasoline will be shipped by water to Great Lakes ports.

JOBBERS MEET IN GREENSBORO

GREENSBORO, N. C., Mar. 26.—The North Carolina Independent Oil Jobbers meeting in the O. Henry Hotel here, elected Joe Glenn of Winston-Salem, N. C., president to succeed E. R. Burt of Biscoe; M. E. Thompson of Goldsboro, was elected first vice president; R. L. Brinson of Charlotte, second vice president; J. H. Harward of Apev, third vice president, and L. H. Martin of Greensboro, secretary. Mr. Brinson, Mr. Harward and Mr. Martin were re-elected. Mr. Thompson succeeds C. S. Wallace of Morehead City. The organization, formerly known as the Associated Oil Jobbers of the Carolinas, changed its name after the South Carolina members formed a separate state body under the national code.

Ship Owners Object to Higher Fuel Oil Prices

NEW YORK, Mar. 23.—The increase in bunker fuel oil prices made effective here this week and at other Atlantic and Gulf Coast points has brought complaints from shipping interests. The new price is $1.30 per barrel, not including 5 cents per barrel lighterage charge. The old price was $1.20 per barrel.

Shipping companies state the 10 cents additional charge will materially increase their operating costs. Threats to return to coal are heard. It is also pointed out that fuel oil is now cheaper in some of the foreign bunkering points. This situation has been brought about partially due to the 21-cent import tax on fuel oil in the United States. South American refiners who formerly shipped fuel oil to the United States for bunkering are now making this oil available at foreign points to ship operators, and the 21-cent tax is thus saved.

"I was very much disturbed when notified of the latest increase in the price of marine fuel oil," said P. A. S. Franklin, president of the International Mercantile Marine Co. "This increase is only one of several that has advanced our fuel bill almost 100 per cent in the last year. Although we have been advocating buy American, ship and travel American, we may be forced to protect ourselves by taking advantage of foreign oil prices, which for the first time in many years are below those in New York."

Mr. Franklin pointed out that the increases in fuel oil prices over the past year have added approximately $20,000 to the cost of a round trip to Europe of the company's United States liner, Washington, and her sister ship, the Manhattan. Each of these ships burns approximately 27,000 bbls. of fuel oil on a round trip.

MORE PRIVATE PLANES

Privately operated business airplanes are increasing more rapidly than the public realizes, according to officials of the Ethyl Gasoline Corp., who have just completed a 7,500-mile flight to survey conditions in the corporation's divisions in the United States and Canada.

D. L. Noyes, veteran pilot in charge of the corporation's new Waco four-passenger cabin airplane, said he say 75 private machines entering or leaving airports where the party stopped. Mr. Noyes added that his group finished in 14 days a journey which, allowing for halts, would have required seven or eight weeks by train.

E. M. Walter and H. W. Kaley, assistant sales managers, left New York on a trip to study spring business prospects in Boston, Baltimore, Atlanta, Tulsa, Kansas City, Los Angeles, Chicago, Dayton, and Toronto, Ontario.

NEWS FOR PETROLEUM REFINERS

California Motor Fuel Sales Show Large Gain

SACRAMENTO, Calif., Mar. 28.—Gasoline distribution in California for the month of February, the shortest month in the year, showed an increase in gallonage over the previous month of 6,573,687 gallons.

The tax for the month of February, 1934, brought $2,795,278 into the state treasury, the State Board of Equalization has announced. This amount of taxes was a loss of 3.7 per cent compared with the gasoline tax of January, 1933. The net taxable gallonage distributed in California during February, 1934, was 94,112,041 gallons.

The companies reporting more than 1,000,000 gallons are as follows:

Name—	Gallons actually sold	Net taxable gallonage
Associated Oil Co.	16,965,850	7,467,931
Bush, R. R. (R. R. Bush Refinery)	1,063,136	1,066,937
Caminol Co., Ltd.	2,475,876	2,443,251
Exeter Refining Co.	1,666,608	1,354,091
General Pet. Corp. of Calif.	16,108,749	6,213,647
Gillis, R. C., and Macmillan, Raymond S., receivers, Macmillan Petroleum Corp.	2,454,462	2,069,165
Gillis, Robert C., receiver, Western Oil & Refining Co.	2,283,526	1,887,726
Hancock Oil Co. of Calif.	2,611,170	2,558,141
Lathrop Investment Corp.	1,088,288	839,350
McDuffie, William C., receiver, Richfield Oil Co. of Calif.	11,014,673	7,477,685
Norwalk Co.	2,040,248	1,144,145
Olympic Refining Co.	1,444,595	1,445,129
Petrol Corp.	1,700,676	1,573,699
Rio Grande Oil Co.	2,304,956	2,007,274
Rolapp, F. H., receiver, Sunset Pacific Oil Co.	2,443,553	1,547,259
Seaside Oil Co.	8,591,856	635,667
Shell Oil Co.	17,864,616	10,735,475
Standard Oil Co. of Calif.	37,893,979	18,244,141
Texas Co.	7,309,786	4,258,152
Union Oil Co. of Calif.	13,769,145	8,988,137
Wilshire Oil Co., Inc.	2,530,493	2,582,238

INDIANA MAKES PROMOTIONS

CHICAGO, Mar. 26.—Organization of executive positions in the lubricating department of the Standard Oil Co. (Indiana) on a basis similar to that in other departments makes L. C. Welch, at present manager of the lubricating department, assistant general manager in charge of the lubricating and technical departments, effective April 1. Mr. Welch will continue to exercise general supervision over all sections of these two departments. C. O. Wilson, assistant manager of the lubricating sales division, becomes manager of the lubricating department and industrial sales. L. G. Campbell, assistant manager of lubricating bulk sales, becomes manager of lubricating bulk sales. J. Clay Lee, assistant manager of railway sales, will become manager of railway sales.

NEW LUBBOCK PLANT

The Lubbock Refining Co. is building a 250-bbl. skimming plant on the Santa Fe Railroad at Lubbock in West Texas, using equipment formerly owned by Humble Oil & Refining Co. at Breckenridge. The plant is to be operated on crude purchased from the Southern Oil Corp. of America's leases in the Boren Pool, Garza County. The refined products will be sold through local retail stations. E. A. Patterson and two others are owners of the plant.

PLANT AT PLAINVIEW

The Plainview Refining Co. is constructing a 500-bbl. skimming plant on the Fort Worth & Denver Railroad at Plainview in the Panhandle district. J. N. Jordan, J. C. Hooper and Winfield Holbrook are organizers of the company.

ROY WIDNEY BUYS REFINERY

CHATHAM, Ontario, Mar. 26.—Roy Widney has purchased the small refining plan heretofore operated by New McDougall-Segur Oil Co. on its acreage in Section 12-20-3w5, Central Turner Valley. In connection with the recent sale of the New McDougall-Segur limestone production to Royalite Oil Co. arrangements were made to market the company's light crude production to Imperial Oil Refineries, Ltd., which made the plant superfluous. The refinery originally was erected to facilitate the handling and marketing of the McDougall-Segur production. It will be dismantled by the purchaser and rebuilt in another portion of the field.

MORE OIL BUSINESS IN 1934

With an increase in output in January over January, 1933, manufacturers of oil burners are looking forward to continued increases over the remainder of the year. The new orders in January totaled 3,180 which compares with 2,502 units in January, 1933. Following are the new orders by months last year as compiled by the Bureau of Manufacturers: January, 2,502; February, 2,527; March, 3,685; April, 3,704; May, 4,691; June, 6,927; July, 9,971; August, 13,518; September, 15,245; October, 12,242; November, 5,871, and December, 3,067.

The oil requirements of these burners at present is approximately 45,000,000 bbls. of the various grades of distillates yearly. It is expected that this total will increase in 1934. The following table gives the estimated number of burners operating by types:

	Draft— Mechanical	Natural	Total
Jan. 1, 1921	5,000	7,500	12,500
Jan. 1, 1922	9,000	12,500	21,500
Jan. 1, 1923	23,500	35,300	58,800
Jan. 1, 1924	47,300	54,500	101,800
Jan. 1, 1925	78,500	103,000	181,500
Jan. 1, 1926	113,900	72,375	186,275
Jan. 1, 1927	177,000	56,250	233,250
Jan. 1, 1928	239,000	71,575	310,575
Jan. 1, 1929	324,980	91,200	416,180
Jan. 1, 1930	416,200	115,000	531,200
Jan. 1, 1931	505,700	137,400	643,100
Jan. 1, 1932	581,900	151,200	733,100
Jan. 1, 1933	642,500	164,700	811,050

GAUNCE MAY PURCHASE PLANT

SHREVEPORT, La., Mar. 26.—The Gaunce Oil & Refining Corp., recently organized here by Bailey Gaunce, formerly of Fort Worth, Tex., is reported to be completing negotiations with Mrs. L. C. Swope of Georgetown for the purchase of the Mid-State refinery in Alexandria. Crude from the Urania Field would be used. M. E. Nash, former assistant director of the minerals division of the conservation department, will supervise the refinery, according to the report. He has been with the company as drilling and production superintendent. Products of the plant, it is said, will include high-grade cold test motor oils, calcium, soda and aluminum base greases.

TEXAS CO. BUILDS DOCKS

HAMMOND, Ind., Mar. 28.—The Texas Corp. has purchased five acres of land on the Indiana Harbor Canal at Canal Street in East Chicago and will begin at once building 500 feet of docks.

Gasoline will be shipped by water to Great Lakes ports, and officials pointed out that rail freight on a barrel shipped from Chicago to Duluth is 90 cents and water freight 11 cents.

AMERICAN REPUBLICS SOLVENT

The American Republics Corp., holding corporation for several oil companies operating in the Southwest, was declared to be solvent in an order made effective March 23 at Wilmington, Del.

United Refining to Add New 2,500-Barrel Unit

WARREN, Pa., Mar. 26.—Construction work is under way on a 2,500-bbl. capacity crude distillation at United Refining Co. here. Many departures from the usual type of fractionating tower unit are incorporated and these are subject to patent development. For this reason the progress of work will be watched with interest in the Pennsylvania grade region where there has been a general movement on the part of refiners to modernize.

It is understood that there will be a single tower, 116 feet high from skirt to top and weighing close to 74 tons. There will be two gasoline streams, and naphtha, kerosene, furnace oil, gas oil, wax distillate, slop wax streams, and bottoms. One of the gasoline streams, it is interesting to note, will be from the uniquely designed salt drum where the temperature is maintained at 180 degrees at atmospheric pressure.

Other improvements at the United plant include replacement of all wooden roofs with steel. Companies participating in the work are Hammond Iron Works and Struthers-Wells-Titusville Co.

TAXES REACH NEW HIGH

State and Federal governments received a sales tax amounting to 43.59 per cent on all of the gasoline sold in the United States last year, and notwithstanding that fact the price of gasoline for the year averaged more than half a cent a gallon cheaper than during 1932, according to revised figures prepared by the American Petroleum Industries Committee. As a basis for the findings, figures were used from the reports of 50 representative cities including one from every state.

The average cost of gasoline to the consumer in 1933 was 17.82 cents a gallon, and 43.59 per cent of that represented taxes. In 1932 the consumer paid an average of 18.43 cents. The average tank wagon price of gasoline, exclusive of the tax, was 11.62 cents, as opposed to 12.45 cents in 1932. The average service station price, exclusive of the tax, was 12.41 cents, as opposed to 13.3 cents for the previous year. The price of gasoline in 1933 was at its lowest on June 1 when the tank wagon price was 10.53 cents, and it reached its highest quotation on October 1 when the tank wagon price was 14.44 cents.

The average gasoline tax reached its all-time highest point in 1933 when the Federal tax was increased from 1 cent to 1½ cents a gallon and Oregon increased its tax rate 1 cent a gallon from 4 to 5 cents. The average tax at the beginning of the year was 5.16 cents a gallon. With the Federal increase it went to 5.67 cents in July, and closed the year at 5.68 cents after the Oregon increase became effective.

OIL AS A PRESERVATIVE

CHICAGO, Mar. 23.—Aside from furnishing gasoline to run our cars, and oil to lubricate them, petroleum is a natural museum for storing the bones of animals which wandered over this planet long before the time of man, Dr. Gustav Egloff, Universal Oil Products Co., Chicago, told the chemical education section of the American Chemical Society.

"Finding Crude Oil" was the subject of his talk, delivered March 23. He also talked of finding skeletons of the imperial mastodon, camel, saber-toothed tiger and thousands of other animals and birds in the La Brea tar pit near Los Angeles.

NEW MICHIGAN PLANT

The new Alma, Mich., skimming plant of the Mid-West Refineries, Inc., will be ready for operation soon after April 1, it was announced by B. J. Skinner of Grand Rapids, president.

Employes of the Chicago Bridge & Iron Works are working night and day to erect five car loads of steel which arrived on the site recently. The Leader Industries, Inc., of Decatur, are putting in the distillation unit. Most of the foundation had been completed last fall.

The new plant already is assured an output for its finished products, Mr. Skinner also announced. It will operate 24 hours a day with four and one-half shifts as provided under the code, he said.

Oil Traffic Body Petitions for Rehearing of Its Case

WICHITA FALLS, Tex., Mar. 26.—A petition for reopening, reargument and consideration by the entire Interstate Commerce Commission of the Wichita Falls Petroleum Traffic Association complaint involving rates on petroleum products from this area to all states east of the Mississippi River and the Indiana-Illinois State line, has been filed with the commission by Dudley B. Foy, traffic manager of the Wichita Falls Chamber of Commerce.

The case was decided against the traffic association by Division No. 3 of the commission on a divided vote of two to one. The commission chairman dissented, stating that he believed the association was entitled to some relief on freight rates, particularly to the Mississippi Valley and the Southeast.

The case was heard in Washington last April, and the decision was handed down in February.

Mr. Foy stated that the petition for rehearing was filed because the association believes that "by reopening and rearranging the case before the entire commission there is a good chance to get the rates altered so the people can do business."

INDIANA ON FIVE-DAY WEEK

Effective April 1 employes in the general offices, refinery offices, and sales division headquarters of Standard Oil Co. (Indiana) in 14 states will work only five days a week. Instead of having only the afternoon free on Saturday, the office workers affected will, as a general rule, have the entire day. A skeleton staff will be on hand to handle necessary business.

The five-day week for office employes was authorized by the management in response to requests by the representatives of employe groups in the Chicago, Detroit, St. Louis and Quincy offices. The new schedule represents only a rearrangement of working hours, as office employes concerned were already working the 40-hour week prescribed by the oil code.

Directors of the company are of the opinion general adoption in industry and trade of a five-day week schedule for office employes will aid recovery.

PETROLEUM CLUB BUILDING

CHICAGO, Mar. 28.—The Chicago Oil Men's Club through its officers, headed by President R. M. McNeilly, has taken a long-term lease on the ground floor of the Arcade Building at 616 South Michigan Avenue, which will be used as club headquarters. The building is changing its name to the Petroleum Building and it is expected to be a center for oil marketing trade firms, several oil company tenants already having been obtained.

Late Fields

OKLAHOMA

The crew on the Denver Producing & Refining Co.'s 9,982-foot test in Caddo County, Oklahoma, resumed bailing Monday afternoon at 4 o'clock and on each pull-out of the bailer a little light oil came with the mud and water. A little gas was also evident. The bailer was lowered to 8,275 feet where it hit a bridge. It was reported on Tuesday morning the bailer might be used to break through the obstruction.

In Garvin County, the Anderson & Kerr test in Section 21-4-1w, had 6-inch pipe cemented at 4,893 feet and was bailing down to the plugs. Seismograph tests will then be made previous to the drilling out of the plugs, which will be done Thursday or Friday. This test is at a total depth of 4,955 feet. The Phillips Petroleum Co.'s test in Section 9-4-1e, total depth 4,671 feet, plugged back to 4,240 feet. Seven-inch pipe was set at 4,164 feet and the hole will be redrilled with standard tools from 4,240 feet.

In the Chandler district, Lincoln County, Twin State Oil Co.'s No. 2, C NW SW Section 1-14-3, started at 1,512 bbls. a day from Wilcox sand at 5,056-68 feet. Amerada Petroleum Corp. and Stanolind Oil & Gas Co.'s No. 4 Brill, C NW NE NE Section 11-14-3, flowed 2,042 bbls. in 24 hours from sand at 5,028-38 feet. Sinclair Prairie Oil Co.'s No. 2, C NW NE NW Section 17-14-3, produced 600 bbls. of oil and 200 bbls. of water in 15 hours from sand at 4,975-84 feet. Magnolia Petroleum Co.'s No. 2, C NE SE Section 18-14-4, got sand at 5,012-22 feet and produced 332 bbls. with no water in 24 hours.

KANSAS

Olson Oil Co. and Shell Petroleum Corp.'s No. 1, C SW SW Section 25-23-4w, a wildcat in Reno County, Kansas, is a 2,000-bbl. initial producer with a gas production of 3,000,000 feet. Chat was found at 3,252 feet. Eight-inch pipe was set at 3,337 feet. The gas pay was at 3,340-61 feet and the oil was at 3,361-67 feet.

There was little additional information from the Vickers-Phillips wildcat in Section 15-25-11w, Stafford County. It was reported shut down for tankage. The well made hourly flows until it was shut in.

The Lauck and others' wildcat test in Section 6-28-1w, Sedgwick County, will be drilled in the latter part of this week.

GULF COAST

HOUSTON, Tex., Mar. 27.—Skelly Oil Co.'s No. 1 Cobb, on the Van Vleck geophysical prospect, northern Matagorda County, was opened six hours and made 20 bbls. of 55 gravity distillate through a quarter-inch choke with estimated 5,000,000 feet of gas; total depth 7,076 feet. In the Splendora area, Montgomery County, Steen Drilling Co.'s No. 1 Texas Long Leaf has drilled to salt water; had good odor of oil at 6,039-45 feet, and salt water sand at 6,045-53 feet. On an 11-minute drill stem test from 6,016-53 feet it showed 23 thribbles of salt water with 250 pounds pressure.

JAMES KEENAN DIES

KANE, Pa., Mar. 23.—James Keenan, 80, oil industry pioneer, died here today. Born in Cattaraugus County in 1853, he was 16 years old when he started work in the oil fields. He worked in Shamburg, Oil Creek and Pithole Fields. For 31 years he was a foreman for South Penn Oil Co. and was retired 14 years ago.

J. H. LIGGETT DIES

Joe H. Liggett, oil operator, is dead at his home in Hutchinson, Kans. A native of Ripley, Ohio, he was instrumental in developing the old Cattleman's oil field near Rosalia, in Greenwood County. He also pioneered in the development of the field in Russell County more than a decade ago.

Representatives of Stripper Wells Urge Consideration of Hours and Wages

WASHINGTON, D. C., Mar. 26.—Representatives of stripper well areas of the various oil producing states met here recently to draw up recommendations directed toward the clarification or modification of the oil code and the endorsement of a definition of a stripper well submitted in February.

These recommendations have been submitted to the Planning and Co-ordination Committee over the following signatures: Harold B. Fell, Independent Petroleum Association of America and Oklahoma Stripper Well Association, Ardmore, Okla.; Ray M. Collins, Oklahoma production committee, Tulsa; William Bell, Illinois-Indiana Petroleum Association, Robinson, Ill.; Earl D. Wallace, Kentucky Oil and Gas Association, Lexington, Ky.; A. V. Clinger, Warren & Forrest Co., Tidioute, Pa.; A. E. Faine, Ohio Penn Grade Oil Producers Association, New Straitsville, Ohio; Carl R. Daugherty, Western Pennsylvania Oil Producers Association, Butler, Pa.; J. C. Martin, production committee, Region No. 1, Bradford, Pa., and William J. Brundred, Central Pennsylvania Oil Producers Association, Oil City, Pa. Mr. Brundred was chairman of the meeting.

The petition drawn up by the stripper well area representatives explains their position thus: "It was felt that the industry as a whole had generally understood that employes on stripper wells would be exempt not only as to the code wage scale but as to hours of labor as well, for anyone in the industry appreciates the wide difference in lifting cost between new and older fields. We felt it advisable to call the attention of the labor policy board to the fact that from 400,000 to 500,000 bbls. daily is produced from stripper wells and represents a back log of dependable reserve available for national defense or current needs. That such wells are constantly being augmented by other younger wells of originally higher productive capacity, but whose declining rate of production with consequent increase in lifting cost has in turn entitled them to consideration not accorded the flush or semiflush areas.

"We want to call to their attention that the dwindling rate of production does not imply exhaustion. On the contrary, cross sections of sands in stripper well areas show 75 to 85 per cent of the original oil content still contained in the sands. Inert oil whose pressure has been dissipated but which can in most cases be recharged and produced with gas or air pressure and in some instances displaced by a water drive, but only at higher crude prices or a lower wage scale.

Share Sacrifices

"It has been argued that labor should not be required to sacrifice standards of living to support an economical operation. On the other hand some sacrifice is necessary or we must contemplate wholesale abandonment of vast reserves of natural resource industry, with enormous capital destruction and increased unemployment. Employes released through such an abandonment would have to be absorbed by other industries. They would not be re-employed in producing the other oil necessary to replace that produced by the abandoned wells, since the procedure would be to merely open wider the gates on the present restricted flowing wells, which would but accelerate their decline until they too would be abandoned through economic pressure of other newly discovered low lifting cost fields.

"Mention has been made of the fact that the industry has received several millions through the increase in the value of refined products to the consumer, not all of which has been passed on to labor. We call attention to the fact that the yearly average service station price of gasoline, ex-tax, in 50 representative cities throughout the United States was 20.97 cents per gallon in 1926, as against 13 cents in 1931, and 13.3 cents in 1932. Such wide variances were reflected in low crude prices, far below the cost of recovery in nearly all fields and ruinous to the stripper well areas. Such increase as we have had therefore has merely lessened our loss.

Seek Definition Acceptance

"The stripper well representatives trust the petroleum administrator may see his way clear to accept the definition of a stripper well. It was felt that such a definition could not be based on the rate of production alone, but was very definitely related to the cost of investment. As depth largely determines investment the provision for a 40-cent gross realization to the working interest for each 100 feet of hole seemed like an equitable solution. It was concurred in by all of the stripper well area representatives at this meeting.

Stripper Well Definition

"Stripper wells are wells of such small production, and of such low gross revenue, that the regular labor provisions of the code as to maximum hours and minimum wages cannot be carried out in their operation and leave a reasonable margin for the operator. For the purpose of providing for as specific a definition as possible under the above general definition of stripper sells the following specific definition is recommended:

"Stripper wells are defined to be those wells whose aggregate production per day from an area comprising a single lease or group of leases within a pool, operated by the same pumper or pumpers, does not return in gross income from the working interest over a six months' period, said periods to begin October 1 and April 1, an amount in excess of 40 cents per day, per 100 feet in aggregate depth of wells on such leases. No well shall be counted in such computation unless it shall have produced oil for a period of at least 120 days during the six months' period. Provided, however, wells that shall be regarded as stripper wells whose average gross income per well for the six months' period shall not exceed $4 per day per well on such lease or group of leases within a pool. operated by the same pumper or pumpers.

"Provided, however, that any operator who feels that on account of peculiar conditions surrounding his particular wells that his wells are stripper wells within the meaning of the general definition, even though they may not fall within the specific definition as set out above, he may petition the state production committee or regional committee of his state or region for a hearing, and should said committee, considering all of the circumstances, determine that his wells are wells of such small production, and of such low gross revenue, that the regular labor provisions of the code as to maximum hours and minimum wages cannot be carried out in their operation and leave a reasonable margin for the operator, they shall certify that said wells are stripper wells within the meaning of the code, and shall upon approval by the Planning and Co-ordination Committee and the oil administrator become effective.

"Further providing that should employes on any well or group of wells feel that while the above definition might include such wells, that the peculiar conditions surrounding said property, should warrant its reclassification as non-stripper wells under the general definition, they also may appeal to the state production committee or regional production committee for a hearing to determine as to whether or not said wells are stripper wells. The findings of said committee shall be effective upon approval by the Planning and Co-ordination Committee and the oil administrator."

Representatives

Regional representatives of the production, transportation and natural gasoline divisions concurring herein were: Region No. 1, production, Walter Hallahan, F. J. Huffman; transportation, D. S. Bushnell, W. A. Sisheimer; Region No. 2, production, Glenn Byers, H. B. Fell.

Regional representatives of the production, transportation and natural gasoline divisions concurring herein were: Walter Hallahan, F. J. Huffman, D. S. Bushnell, W. A. Sisheimer, Glenn Byers, H. B. Fell, Paul Blazer, P. R. Applegate, C. P. Hickok, Harry Moreland, E. L. Peck, William Bell, J. C. Donnell, II, James G. Graves, Ray Miller, M. J. Delaney, Tom D. Phillips, O. D. Donnell, Hal W. Stewart, A. E. Faine, Ray Collins, K. S. Adams, R. C. Jopling, D. E. Beach, Earl D. Wallace, J. F. MacMahon, T. R. Goebel, H. W. Klein, E. P. Sibele, E. L. McDonald, Bert Hull and J. C. Young. E. H. Eddleman was acting secretary.

South Penn Co. Holds Its Semiannual Open Forum

OIL CITY, Pa., Mar. 24.—The semiannual open forum meeting of South Penn Oil Co. officials and delegates from districts in which the company operates in Pennsylvania was held here this week with 32 in attendance. Twice a year the employes of the company elect representatives who exercise the traditional privilege of "telling the officers what changes are needed in the interests of the employes' welfare."

The following officers and delegates took part in the meeting:

P. H. Curry, president; F. J. Huffman, vice president; C. B. Turner, vice president, and C. S. Stevenson, general manager. Bradford district: F. M. Schell, drilling superintendent; O. C. Carlson, production superintendent; A. A. Downing, assistant superintendent; Roy Harris, assistant superintendent; Clarence Graham, assistant superintendent; Bert Blaisdell.

Oil City district: J. L. O'Neil, superintendent; William H. Clay, William Nicklin. McDonald district: J. C. Mettler, superintendent; Andrew Watson, assistant superintendent; Clyde Cowden. Tiona district: W. P. Dorrion, superintendent. Polk district: J. A. Gates.

Rew district: Carl H. Sparks, Dan Burns. Venus district: C. G. Kiser, John Schmid. Kane district: Roy Ahlberg. Sheffield district: George Sheppard. Eldred district: Arthur Gill. Pleasantville district: Robert W. Clark. Chicora district: C. W. Bell. Oakdale district: W. E. Slater. Washington district: William Stuck. Butler district: George Gates; and Belle View district: A. Seybert.

PENNZOIL ELECTION

OIL CITY, Pa., Mar. 24.—All of the directors of the Pennzoil Co. were re-elected at the annual meeting of stockholders here. They are: C. L. Suhr, Jay F. Vandeventer, Dan J. Cavanaugh, R. A. Brown, P. H. Curry, F. J. Huffman, C. B. Turner, John Hays and M. A. Brewster.

WALTER D'ARCY RYAN DEAD

Walter D'Arcy Ryan, 64, General Electric illuminating engineer, known as the man who first made artificial illumination, both a science and an art, died in his home in Schenectady, N. Y., March 14, of heart trouble.

CONSOLIDATED ROYALTY OIL

CASPER, Wyo., Mar. 26.—At a meeting of the board of directors of the Consolidated Royalty Oil Co., a quarterly dividend of 5 cents per share was declared, payable April 25, 1934, to stockholders of record of April 15.

C. C. JULIAN DEAD

C. C. Julian, formerly of California and Oklahoma City, died at Shanghai, China, March 25.

NATURAL GASOLINE MANUFACTURE

Skelly Will Build Plant in Oklahoma Osage Field

The Skelly Oil Co. will start construction this week on a 10,000-gallon natural gasoline plant in the Osage Field of Oklahoma. It will include 13 twin 170-horsepower Bessemer compressors and two 80-horsepower units with the layout of the plant so arranged to allow for substantial expansion should conditions in the new Osage Pool make such a move desirable. The exact location is described as in the SE NW Section 10-25-6e, on the Midco Oil Corp. lease.

Equipment is being segregated to process 10,000,000 feet of gas daily. Extraction of the gasoline will be by compression only for the time being but provisions are being made in the plant design to add absorbers later.

Much of the residue gas from the plant will be returned to the leases but excess quantities will be delivered to the lines of the Kay County Gas Co. Construction is expected to be completed within two months.

CURTAILMENT MEETING

FORT WORTH, Tex., Mar. 27.—Efforts are now being made by natural gas producers and crude oil producers in the Panhandle area to work out an equitable plan of curtailing all operations with the view of cutting down natural gasoline production in the area to where a reasonable market price may be maintained. The long controversy that has been going on between the gas pipe lines and the producers looked a little nearer the end when a meeting was called by one of the major gas pipe line interests a week ago to be held in Kansas City. The meeting was not held however and some relief is now being sought in a meeting of natural gasoline plant operators and producers in the Panhandle at Fort Worth today.

The plan calls for a voluntary curtailment of both gas and crude oil production but the discussion thus far has not led to any definite program to assure favorable results. It is believed that as a plan is developed and sufficient time has been given to all interested parties that something tangible may be worked out but it is doubtful that stripper plan operators and the pipe line interests will come to an agreement on this basis alone.

START TEXAS COMPANY PLANT

The Texas Co. now has its new 10,000,000-foot natural gasoline plant on the Les. K. Johnson lease along the western edge of Foard County, near Wichita Falls, Tex., in operation. Gas is being supplied from the newly developed local field. Construction of the new unit was started about the middle of November and the plant provides for expansion as additional gas is made available in the field. The Texas Co. holds a large block of acreage in the local field and the development of it is largely in its hands.

INCREASE SHOWN IN IMPORTS

Natural casinghead gasoline imports in December, 1933, were recorded at 4,771,648 gallons, worth $400,786. The preceding month's imports were 24.1 per cent lower at 3,620,125 gallons, with a valuation of $270,237. Importations of gasoline lighter than .8235 specific gravity at 60 degrees temperature reached a total of 795,244 gallons, appraised at $82,938, as compared with 760,305 gallons at $85,231.

ASK FOR CARBON BLACK PERMIT

Permission from the Oklahoma Corporation Commission to build a carbon black plant near Guymon, Okla., is being sought by Ben Ash. The capacity of the proposed plant is not known.

Texas Christian University Alleges the State Sour Gas Law Unconstitutional

In the past week one group of Texas State representatives found themselves in disagreement with another group in regard to the interpretation and validity of the Panhandle "sour gas law." The Texas Christian University alleged that ruthless waste is being practiced in that area and brought complaints against three companies because of alleged draining of the university's land.

One of the suits was directed against the J. M. Huber Petroleum Co. and another against Phillips Petroleum Co. and Continental Oil Co. The suits filed are the fifth and sixth filed by Texas landowners against this alleged gas wastage. Incidentally this marks the second entrance of a major educational institution into the courts to protect oil and gas interests. The University of Texas has been a frequent litigant to defend its oil and gas interests. The suits just filed, however, mark the first appearance of the Christian Church's Texas educational institution in this capacity.

Burnett Interest Involved

The basis of Texas Christian University's complaint as set out in the petition, is an allegation that the wasteful operations of the defendants is seriously damaging the institution's interests in the Burnett ranch holdings of over 100,000 acres in Carson and Hutchinson Counties, all of which is alleged to be underlain with oil and gas. The college is the sole beneficiary of the trust estate set up by the late Mary Couts Burnett, widow of Burk Burnett, conveying her community property interest in this land. The trustees of the college, including both clerical and lay leaders of the church in Texas, are joined in the suit by the trustees of the Mary Couts Burnett trust, and executors of the Burnett estate.

The petition alleges that the Panhandle Field originally contained 13,000,000,000,000 feet of gas and a quarter of this amount already has been brought aboveground—three-fourths of it in ruthlessly wasted manner. Dissipation is continuing at a tremendous rate, according to further allegations.

More than 600,000,000 feet per day, after being stripped of only 3 per cent of its heat value, is being turned loose in the air each day, the petition sets out. Another 400,000,000 feet or more is being burned each day in carbon black plants after being stripped, but in this process only a small part of the fuel value is utilized, it is claimed—most of the carbon and heat value being wasted in the air in the form of dense clouds of smoke, visible for many miles.

Gas which is run through the stripping process returns only one-quarter of a cent per 1,000 feet, and gas stripped and later burned in the carbon black plants less than a cent, plaintiff avers.

If it were conserved and utilized for domestic and industrial fuel, the return from the gas would be three and a half times more than received from that now processed through the carbon black plants, and more than 14 times as much as is received for that stripped in the natural gasoline plants and then blown into the air.

The J. H. Huber Petroleum Co. is alleged to be producing gas from five wells adjacent to the Burnett lands, in which Texas Christian University has an interest, and the gas is turned over for processing to the Pacific American Gasoline Co., a subsidiary.

In the other suit, Continental Oil Co. is named as producing gas from two wells on the Burnett lands, delivering the gas later to a natural gasoline plant of the Phillips Petroleum Co.

Official records of the Panhandle office of the Texas Railroad Commission indicate that Phillips Petroleum Co. is the owner of seven natural gasoline plants in Carson and Hutchinson Counties, adjacent to these properties, which are blowing more than 175,000,000 feet of gas into the air daily, and processing more than 200,000,000 feet additional for carbon black—the former figure being more than twice the Railroad Commission's official report of the daily requirements of the whole State of Texas for fuel.

The companies named as engaged in production of gas are alleged to have already produced practically all of the gas which was originally under their leases, and as a result their continued operations are claimed to be draining gas from under the lands of the plaintiffs. Plaintiffs concede their rights to do this, under the laws of Texas, if the production activities were for a lawful and worthy purpose, but denying their right to continue damaging plaintiff by what is termed unlawful and prodigal operations.

Their operations not only are draining gas, as such, from under plaintiffs' land, but are dissipating the propulsive force to large oil reserves under lands in which the school has an interest, it is alleged. The petition estimates that continued operations of this character will result in rendering 400,000,000 bbls. of petroleum now recoverable, irrecoverable.

The suits as in the case of the landowners' suits before them, attack the constitutionality and legality of an amendment to conservation statutes passed at a session of the legislature a little over a year ago, which, in effect, exempted the Panhandle Field from the conservation laws in effect in all other gas fields.

Among the numerous grounds on which its legality is attacked, is that it constitutes a local law, prohibited by the state constitution, and is a law which provides for dissipation of a natural resource where the constitution of the State expressly commands the legislature to take steps for their conservation.

SENATE TO INVESTIGATE

AUSTIN, Tex., Mar. 26.—The senate investigating committee, whose powers recently were extended to include oil and gas matters, has been called by its chairman, Senator Will Beck of Bowie County, to meet at Amarillo April 9 for a hearing on charges of major natural gas operators, of extensive waste under the sour-gas law permits by which operators without fuel market outlet are being allowed to process and waste gas from the Panhandle.

Doctor Beck, in calling the hearing, said he believed a law should be necessary requiring that the smaller operators be furnished a market outlet, or as an alternative, paid for the drainage of their gas.

Members of the committee are: Doctor Beck, chairman; Messrs. Redditt, Purl, Woodward, Woodruff, Martin.

Natural Gasoline Now Only Product With Lower Price

Pleading the case of the small independent natural gasoline plant operator, R. R. Dean of the Del Rey Gasoline Co. sent the following telegram to Oil Administrator Ickes and J. D. Collett, chairman of the local regional committee:

"Submitting for your consideration the following facts and present market quotations for petroleum and its products the industry operating under the oil code and NRA in comparison with the market quotations of one year ago or before the adoption of the code and NRA. Weighted average Mid-Continent crude March 23, 1933, posted price 44 cents per barrel, present posted price $1, increase 127 per cent. Sixteen gravity fuel oil, 32½ cents, now 55 cents, increase 60 per cent. UGI gas oil, 1 cent per gallon, now 2⅛ cents, increase 112 per cent. Thirty-eight-forty furnace oil, 1⅞ cents, now 2⅞ cents, increase 53 per cent. Kerosene, 2¼ cents, now 3¼ cents, increase 44 per cent. U. S. Motor gasoline, 2⅜ cents, now 4⅛ cents, increase 73 per cent. Chicago service station price regular grade, less tax, was 10.1 cents, now, less tax, 14.3 cents, increase 41 per cent. Twenty-six-seventy grade natural gasoline was 1⅝ cents, now 1½ cents, down in price 8 per cent.

"There are a great number of small natural gasoline manufacturers who are not affiliated with refiners or marketers and who are not properly represented on any board or committee handling your code. Our company is representative of a large number of small independent natural gasoline manufacturers who willingly and conscientiously signed the NRA code and agreed to increase manufacturing cost by increasing labor cost and not to sell their products below the cost of production. We are now confronted with the situation of either violating and repudiating our sincere pledges relative to labor and cost of production or else discontinue operating under the code and return our employes to the army of unemployed. This situation has developed through three fundamental evils: First, hot oil; second, the utter disregard of the refinery industry to attempt to maintain a fair and just price for natural gasoline in line with a reasonable differential based on the U. S. Motor; and third, but just as important as the other two above mentioned, the exploiting of natural resources at a great sacrifice to conservation and without benefit to the greatest good for the greatest number. This exploiting being done by a small group for only temporary gain to themselves.

"The remedy: First, restore this branch to its former position in the industry as one of conservation and not exploitation; second, demand of the refineries that they absorb this natural product at a fair and reasonable profit to themselves and for the benefit of the consumer in the form of more volatility and higher octane gasoline. The plight of these companies is presented to you with the inquiry as to whether you think their position is reasonable in line with the other branches of the industry and as to whether some relief should not be attempted which would permit them to fulfill their code obligations."

CANADIAN ABSORPTION PLANT

CALGARY, Alberta, Mar. 24.—A. H. Mayland, president of Independent Gas Producers, Ltd., has announced that a gasoline absorption plant to handle residual gas production of independent companies will be built in the Turner Valley Field this season. It is expected that final arrangements will be completed this month.

1934 Annual Refinery Number

OF THE OIL AND GAS JOURNAL

Herein we learn more about an industry whose 600 domestic plants

- represent an investment considerably over $2,500,000,000
- during 1933 manufactured products worth $1,100,200,000
- purchase $122,000,000 worth of new equipment annually
- buy $55,000,000 worth of chemicals and supplies annually
- and operate DAY and NIGHT every day in the year . . . . . .

INCLUDING LIST OF REFINERIES IN NORTH AMERICA WITH PERSONNEL

Modern Refinery Design Calls for Heat Transfer Coefficients Over Wide Temperature Range

By REZA FALLAH, B. Sc.*

One of the most important operations in refinery practice is the transfer of heat to fluids flowing through different sections of the unit. The economics of modern oil refining demand the installation of equipment involving a minimum capital outlay with a maximum operating efficiency. The design of such plant, therefore, becomes a matter for careful consideration which necessitates accurate information on the magnitude and variation of heat transfer coefficients over a wide range of conditions. The principles employed in computing such coefficients are outlined briefly in this paper.

Newton's Law—The quantity of heat passing a given section at right angles to the direction of heat flow is directly

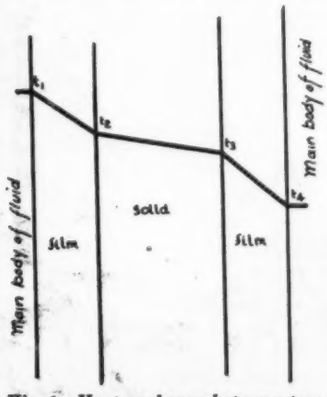


Fig. 1—Heat exchange between two liquids separated by solid wall

proportional to the area of this section, A, to the difference of temperature between the two faces of this section, dt, to the time, dθ, and inversely proportional to the thickness dL.

$$\text{Thus } \frac{dQ}{d\theta} = \frac{dt}{dL} k A \text{ — B.t.u.'s/hr.} \quad (1)$$

where k = coefficient of heat conductivity in B.t.u.'s per hr. per sq. ft. per (°F./ft.)

If the quantity of heat crossing the unit area per unit time is constant we get:

$$\frac{Q}{\theta} = -kA\frac{dt}{dL} = kA\frac{(t_2-t_3)}{L_2-L_3} = kA\frac{\Delta t}{L} \text{ B.t.u.'s/hr.} \quad (2)$$

where Δt = difference of temperature between the two faces of the section
L = thickness.

Heat flowing through several bodies in series.—We can rewrite (2) as follows:

$$\frac{Q}{\theta} = \frac{\Delta t}{\frac{L}{kA}} = \frac{\Delta t}{R} \text{ B.t.u.'s/hr.} \quad (3)$$

where "R" represents the resistance of the body to heat flow. If there are "n" resistances in series, we obtain the following equation:

*Research student, department of oil engineering and refining, University of Birmingham, England.

TABLE 1—CONSTANTS PROPOSED IN THE NUSSELT TYPE OF EQUATION

Reference:	Author—	Date	a	n	m	e	Fluid inside pipe—
2	Nusselt	1909	0.0255	0.786	0.786	0	Gases.
9	Nusselt	1913	0.0302	0.786	0.786	0.054	Gases, water.
10	Nusselt	1917	0.0362	0.786	0.786	0.054	
11	Grober	1921	0.0350	0.79	0.79	0.05	Gases.
12	Rice	1923	0.0270	0.77	0	0	Gases.
13	Rice	1924	0.0157	0.83	0.50	0	Gases, water.
14							
15	McAdams	1925	0.0178	0.83	0.38	0	Gases, water, oil.
16	Purday	1927	0.026	Note 1		0	Gases, water, oil.
*17	Morris and Whitman	1928	Note 2		0.37	0	Water, oils.
18	Cox	1928	0.0191	0.83	0.33	0	Gases, water, oils.
19	Hinton	1928	0.0281	0.80	0.355	0	Gases, water, oils.
19	Hinton	1928	0.0265	0.80	0	0	Gases.
20	Keevil	1930	function of (DG/μ)		0.37	0	Water, oils.
8	Dittus and Boelter	1930	Note 3	0.80	Note 3	0	Gases, water, oils.
21	Nusselt	1930	Note 4	0.75	1.0	0	Gases.
3	Lawrence and Sherwood	1931	0.0561	0.70	0.50	0	Water.
7	Sherwood and Petrie	1932	0.024	0.80	0.40	0	Gases, water, oils, acetone, n-Butyl alcohol.

*Presented at Detroit meeting of American Chemical Society, September, 1927.

Note 1. $n=0.792/(C\mu/k)^{0.467}$.

Note 2. A graphical function of $DV\rho/\mu$. For cooling, use 0.75h for heating.

Note 3. a=0.0243 and m=0.4, for heating; and a=0.0265 and m=0.3, for cooling.

Note 4. $a=0.0296\sqrt[3]{T_g/T_w}$, where T_g and T_w are absolute temperatures of gas and wall, respectively.

$$\frac{Q}{\theta} = \frac{\Delta t}{R} = \frac{\Delta t_1+\Delta t_2+\ldots+\Delta t_n}{R_1+R_2+\ldots+R_n} = \frac{\Delta t}{\frac{L_1}{k_1A_1}+\frac{L_2}{k_2A_2}\ldots+\frac{L_n}{k_nA_n}} \quad (4)$$

Figure 1 (not to scale) shows the heat exchange between two fluids separated by a solid wall. It is seen that the temperature gradient in the two fluid films is

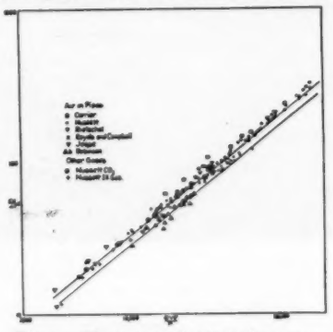


Fig. 2—Heat transfer data for gases

steep but is negligible across the solid retaining wall, on account of the latter having a good heat conductivity compared to that of the fluids.

It would be an easy matter to design heat exchange equipment if the effective fluid film thicknesses were known since

$$\frac{Q}{\theta} = kA\frac{\Delta t}{L_i} \text{ B.t.u.'s/hr.}$$

The effective thickness of the fluid film, L_i, however, is unknown and it is usual in such cases to replace $\frac{k}{L}$ by h, i.e.,

$$\frac{Q}{\theta} = hA\Delta t \text{ B.t.u.'s/hr.} \quad (5)$$

where h = film coefficient of heat transfer in B.t.u.'s/hr./sq. ft./°F. temperature difference.

Thus equation (4) applied to the case in Figure 1 becomes

$$\frac{Q}{\theta} = \frac{\Delta t}{\frac{1}{h_1A_1}+\frac{L_2}{k_2A_2}+\frac{1}{h_2A_2}} = \frac{\Delta t}{R} = H\,A_{av}.\Delta t \quad (6)$$

$$H.A_{av.} = \frac{1}{\frac{1}{h_1A_1}+\frac{L_2}{k_2A_2}+\frac{1}{h_2A_2}} \quad (7)$$

where $A_{av.}$ = average of the areas.
H = overall coefficient of heat transfer.

If the retaining wall is of metal, such as a metallic pipe wall, in practice its resistance can usually be neglected except where the heat transfer coefficients through the fluid films are very high or where thick tubes are used.

Formula (7) applies to clean pipes only, and where a scale or deposit forms

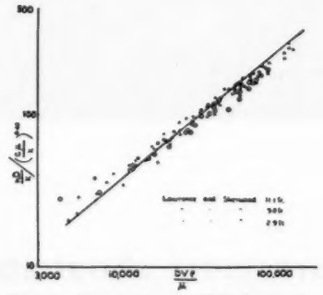


Fig. 3—Heat transfer data for water

on the pipe wall a further resistance to heat flow is introduced which in some cases can exceed the resistance of the fluid films, thus the final form of equation (6) becomes

$$H.A_{av.} = \frac{1}{\frac{1}{h_1A_1}+\frac{L_2}{k_2A_2}+\frac{L'_2}{k'_2A'_2}+\frac{1}{h_2A_2}} \quad (8)$$

where $\frac{L'_2}{k'_2A'_2}$ represents the resistance of the deposit or scale.

This resistance due to the scale can be increased by its combination with oil, the oil being absorbed in the pores of the scale and forming a coating which offers a much higher resistance to heat flow.

The practical difficulty in determining the resistance of such scales is obvious and nearly all the data so far obtained have been for clean tubes.

The method usually adopted is to calculate the overall coefficient of heat transfer from equation (7) and multiply the result by a "cleanliness factor" which depends largely on the type of fluid, the nature of the plant, the allowable cleaning intervals, etc., and with our present state of knowledge must be left to the experience and judgment of the designer. The value of this factor may vary between .3 and .9.[1]

The heat transfer per unit area is very low when fluid flow is viscous, thus

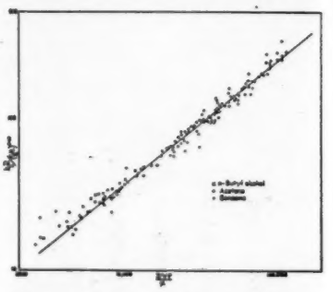


Fig. 4—Heat transfer data for n-butyl alcohol, acetone and benzene

whenever possible the heat exchange apparatus should be proportioned to give turbulent flow and in what follows the latter case only has been dealt with.

Calculation of Film Coefficient

In order to calculate the overall heat transfer coefficient, the values of the individual film coefficients are first determined. The individual coefficient, however, is not a constant, even for a given fluid and is a complex function of many variables such as the physical properties of the fluid, its velocity and the nature and the shape of the retaining surface.

The principles of dimensional similarity provide a method of correlating data in order to develop an equation whenever the number of variables are too many to be investigated separately. These variables are gathered into dimentionless groups and the problem is thus reduced to one of finding the group functions only.

The factors which influence the heat transfer coefficient in turbulent flow are the diameter of the pipe, linear velocity of the fluid and its physical properties, namely, density, specific heat, absolute viscosity and coefficient of thermal conductivity.

From a consideration of the above, Nusselt[3] proposed the following equation:

$$\frac{h\,D}{k} = \phi_1\left(\frac{DV\rho}{\mu}\right)\phi_2\left(\frac{C\mu}{k}\right) \quad (9)$$

where D = diameter of the pipe
k = thermal conductivity of fluid
C = specific heat of fluid
μ = viscosity of fluid
ρ = density of fluid
V = linear velocity of fluid
ϕ_1 and ϕ_2 = functions to be determined.

Nusselt assumed power functions writing

$$\frac{h\,D}{k} = a\left(\frac{DV\rho}{\mu}\right)^n\left(\frac{C\mu}{k}\right)^m \quad (10)$$

Another dimentionless group $\frac{D}{L}$, where L is the length of pipe, is sometimes used, this allowing for the extra turbulence

produced near the tube entrance which increases the heat transfer.

Lawrence and Sherwood[3] carried out experiments on the heat transfer in water in turbulent flow, in an apparatus designed so that end effects were present, and found no appreciable effect in the heat transfer in the range between 59 and 224 ratios of the heated length to diameter.

Gases — The value of the group $\frac{C\mu}{k}$ varies very slightly from one gas to another and for different temperatures and pressures.

Figure 2 shows some of the available data for gases; the upper line represents

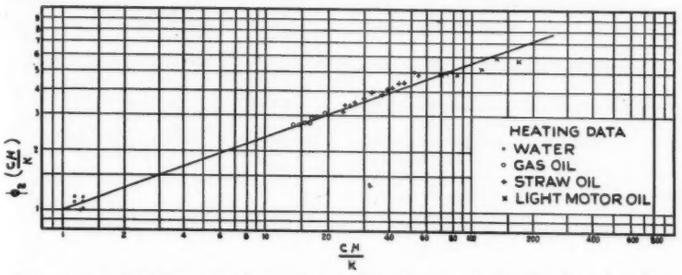


Figure 5—Heating data for water and various petroleum oils, showing first relationship

McAdams[4] equation where the average value of 0.73 has been substituted for $\frac{C\mu}{k}$ giving

$$\frac{hD}{k} = 0.020 \left(\frac{DV\rho}{\mu}\right)^{0.8} \quad \ldots\ldots(11)$$

the upper line represents the prediction of $\frac{hD}{k}$ from $\frac{DV\rho}{\mu}$ from Prandtl's[5] analogy and the lower line represents the prediction from Reynolds'[6] analogy.

Water—Lawrence and Sherwood[3] obtained extensive data on heating water, Figure 3, which are in agreement with the equation of McAdams[4].

$$\frac{hD}{k} = 0.0225 \left(\frac{DV\rho}{\mu}\right)^{0.8} \left(\frac{C\mu}{k}\right)^{0.4} \quad \ldots\ldots(12)$$

Other Liquids—The data of Sherwood and Petrie[7] for heating n-butyl alcohol, acetone and benzene plotted on Figure 4 show good agreement with the equation of McAdams.

The most reliable equation proposed so far is probably that of Dittus and Boelter[8], who studied the data of several investigators on air and water and also the data of Morris and Whitman[17] on heating and cooling oils.

Their equation is:

$$\frac{hD}{k} = 0.024 \left(\frac{DV\rho}{\mu}\right)^{0.8} \left(\frac{C\mu}{k}\right)^{0.4}$$

for heating ....(13)

and $\frac{hD}{k} = 0.026 \left(\frac{DV\rho}{\mu}\right)^{0.8} \left(\frac{C\mu}{k}\right)^{0.3}$

for cooling ....(14)

where fluid properties correspond to the main body average temperature.

Some investigators use the properties of the fluid at the mean film temperature, but the use of the main body average temperature is much easier for the designer and hence its use has been adopted here.

Table 1 given by McAdams[4] is a review of the constants proposed in the Nusselt type of equation by different investigators.

$$\frac{hD}{k} = a \left(\frac{DV\rho}{\mu}\right)^{n} \left(\frac{C\mu}{k}\right)^{m} \left(\frac{D}{L}\right)^{e} \quad \ldots\ldots(15)$$

From the data of Morris and Whitman[17] using the main stream properties we can obtain an easy method of determining h. As stated below we have:

$$\frac{hD}{k} = \phi_1 \left(\frac{DV\rho}{\mu}\right) \phi_2 \left(\frac{C\mu}{k}\right) \quad \ldots\ldots(9)$$

using the following units:

D = diameter of pipe in inches.
h = coefficient of heat transfer in B.t.u.'s/hr./sq. ft.°F.
k = thermal conductivity in B.t.u.'s per hr./sq. ft./°F./ft.
ρ = density of fluid in lbs./cu. ft.
V = average velocity in ft./sec.
μ = viscosity in centipoises.
C = specific heat.

Figure 5 is a plot of $\phi_2\left(\frac{C\mu}{k}\right)$ VS $\frac{C\mu}{k}$ and Figures 6 and 7 are plots of $\phi_1\left(\frac{DV\rho}{\mu}\right)$ VS $\frac{DV\rho}{\mu}$ for heating and cooling runs respectively.

For a given set of conditions "h" is calculated as follows:

Calculate $\frac{C\mu}{k}$ and $\frac{DV\rho}{\mu}$ and read $\phi_2\left(\frac{C\mu}{k}\right)$ and $\phi_1\left(\frac{DV\rho}{\mu}\right)$ from the Figure 5 and figure 6 or 7. Then calculate $\frac{hD}{k}$ from equation (9) when h is readily found.

For instance, suppose a crude oil is being treated in a long pipe 3.07 inches diameter, the oil is at 150° F. and at that temperature its density is 50 pounds per cubic foot, its viscosity 1.5 centipoises and its specific heat 0.51. It is flowing with a linear velocity of 2 ft./sec. then

$$\frac{DV\rho}{\mu} = \frac{3.07 \times 2 \times 50}{1.5} = 205$$

$$\frac{C\mu}{k} = \frac{0.51 \times 1.5}{0.078} = 9.8$$

From Figure 6 since heating is being considered

$$\phi_1\left(\frac{DV\rho}{\mu}\right) = 1600$$

From Figure 5 $\phi_2\left(\frac{C\mu}{k}\right) = 2.3$

Therefore

$$\frac{hD}{k} = \phi_1\left(\frac{DV\rho}{\mu}\right)\phi_2\left(\frac{C\mu}{k}\right) = 1600 \times 2.3 = 3700$$

and $h = \frac{3700 \times 0.078}{3.07} = 94$ B.t.u.'s per hr./sq. ft./°F. mean temperature difference.

If the oil changes greatly in temperature while flowing through a pipe it is not permissible to take its average temperature and from this calculate an average coefficient since the temperature viscosity curves are not straight lines.

Where the viscosity change is great it is suggested that for calculation purposes the pipe be broken up into sections in which the viscosity does not change more than say three fold.

Optimum Velocity of the Fluid Inside the Pipe

It can be seen from the foregoing that when fluids are flowing in turbulent motion high velocity gives good heat transfer, and therefore reduces equipment expense, but causes undue power consumption.

In designing heat transfer equipment, the fluid velocity should be chosen to secure a proper economic balance between installation and operating costs.

If the diameter of the pipe is known the optimum velocity which makes the total costs a minimum can be calculated from the following formula:[20]

$$V_o = \sqrt[2.75]{\frac{3070\, be}{ac(D\rho)^{.75}\,\mu^{.25}\left(1+50\frac{D}{L}\right)}} \quad \ldots\ldots(16)$$

where V_o = optimum value of velocity in feet/sec.
a = cost of energy in dollars per horsepower hour delivered to the fluid, allowing for efficiencies of motors, pumps, maintenance, and operation of pumping equipment, etc.
b = total cost installed of pipe, in dollars per foot of length.
C = total hours of operation per year, corrected for load factor on the apparatus.
D = inside pipe diameter in feet.
e = per cent annual charges on the heat exchange equipment, including fixed charges, maintenance, depreciation, etc.
ρ = density of fluid in lbs. per cubic foot.
μ = viscosity of fluid relation to water at 68° F.
L = length of each unit of straight pipe in feet.

Having fixed the diameter and the velocity the film coefficient is readily calculated as shown before from which the overall coefficient of heat transfer is derived.

The next step is to calculate the area of the heat exchanger and therefore its length

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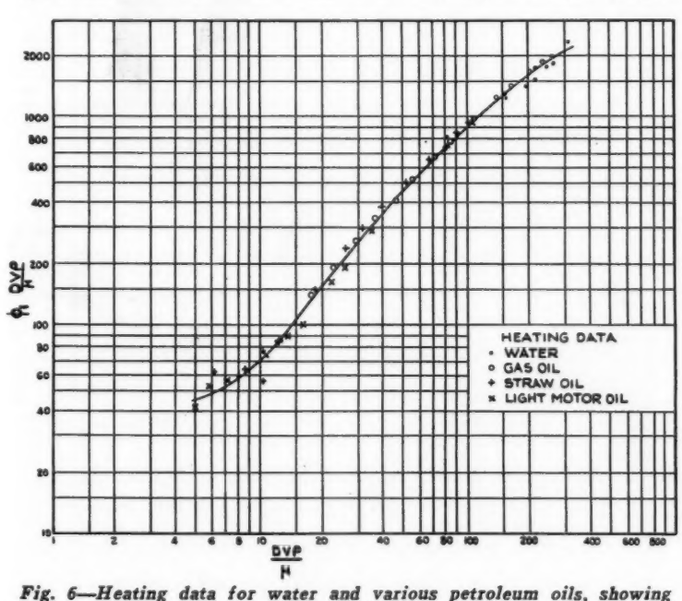


Fig. 6—Heating data for water and various petroleum oils, showing second relationship

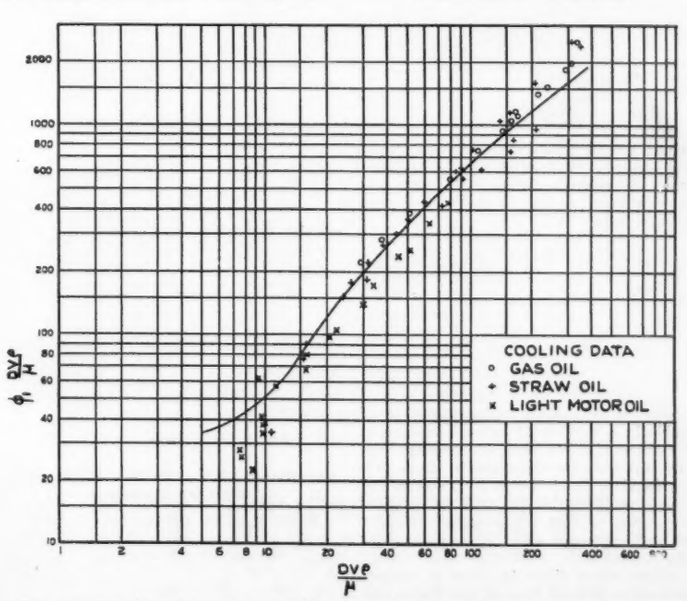


Fig. 7—Cooling data for water and various petroleum oils, using same values for plotting as in Fig. 6

$$\frac{Q}{\theta} = H.A.\ \Delta t \quad \ldots\ldots\ldots\ldots (6)$$

Mean Temperature Difference

In a heat exchange apparatus whether employing counter current or parallel flow principles the temperature of the fluid varies from the inlet to the exit and a mean temperature difference "tm," should be used instead of Δt.

The temperature of the pipe may be constant or vary. Considering the case where T is the constant temperature of the pipe and W the weight of fluid flowing in unit time, let the average temperature of the fluid at a section along the pipe be t; let the temperature of the fluid be raised dt as it flows over an element of pipe surface, area dS, at the section under consideration. The heat absorbed by the fluid in a given time in flowing over the surface element dS, is the same as the heat transmitted through dS in the given time, or

$$WCdt = -h(T-t)dS. \quad \ldots\ldots\ldots (17)$$

Assuming that h and c remain constant for the whole length of pipe, the total surface area of the pipe will be given by

$$S = \frac{Wc}{h} \log_e \frac{(T-t_1)}{(T-t_2)} \quad \ldots\ldots\ldots\ldots (18)$$

where t_1 and t_2 are the initial and final temperatures of the fluid. If the temperature difference between fluid and pipe was constant and equal to (T-t) av., we should have

$$(T-t_1)-(T-t_2)\ Wc = h(T-t)_{av.} \times S \quad \ldots (19)$$

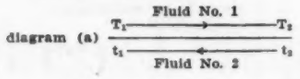
Hence

$$(T-t)_{av.} = \frac{(T-t_1)-(T-t_2)}{\log_e \dfrac{(T-t_1)}{(T-t_2)}} = tm \quad \ldots\ldots (20)$$

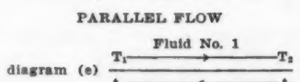
For either counter or parallel flow of fluids in a perfectly insulated exchanger, in which changes only in sensible heat are involved, the decrease in T is proportional to the increase in t, and it can be shown that this equation is applicable assuming that the overall coefficient of heat transfer and the specific heat are constant.

Cases where there is either a counter current or parallel flow of two fluids and where T changes say from T_1 to T_2 are shown in the following diagrams:

COUNTER CURRENT FLOW



PARALLEL FLOW



the mean temperature difference is given as before by:

$$tm = \frac{(T_1-t_1)-(T_2-t_2)}{\log_e (T_1-t_1) - \log_e (T_2-t_2)} \quad \ldots\ldots (21)$$

the determination of tm from above is a complicated operation requiring the use of logarithm tables.

Call $T_1 - t_1 = t$

$T_2 - t_2 = t^1$

then we have $tm = \dfrac{t-t^1}{\log_e t - \log_e t^1} \quad \ldots\ldots (22)$

Figure 8[28] is an alignment chart for determining tm where, the values of tm, t and t^1 satisfying the above equation fall on the same straight line, thus for example:

If $t = 24$ degrees

$t^1 = 90$ degrees

we can read $tm = 49.8$ degrees at the intersection of the straight line passing through the points 24 and 90 of the curved scale with the straight scale along the ordinate axis, but we can also read

$\dfrac{tm}{2} = 24.9$ at the intersection of the straight line passing the points $\dfrac{t}{2} = 12$ and $\dfrac{t^1}{2} = 45$ of the curved scale with the ordinate axis.

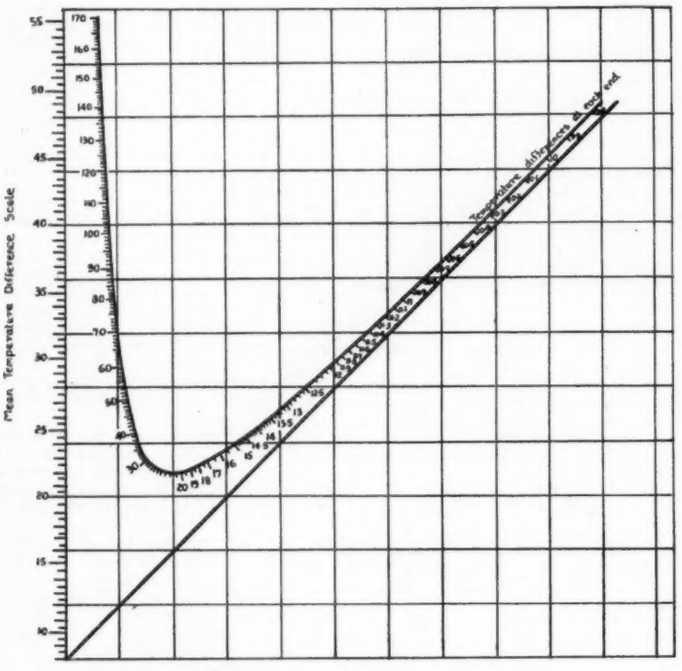


Fig. 8—Alignment chart for determining value of tm

Calculation of the Surface of the Heat Transfer Apparatus

From equation (6) we have

$$A = \frac{Q}{\theta} \times \frac{1}{H} \times \frac{1}{tm} \quad \ldots\ldots\ldots\ldots (23)$$

Figure 9[28] furnishes a graphical method of determining A as follows:

Example—Calculate the surface of a heat transfer apparatus to transfer 1,000,000 B.t.u.'s per hour under conditions corresponding to the following diagram, with a heat transfer coefficient H = 150 B.t.u. per sq. ft. per degree F. per hour.

The temperature difference at each end are 54° F. and 15° F., respectively.

Using Figure 9, the straight line passing through the graduations 15° and 54° of the curved scale intersects the ordinate axis at a certain point corresponding to the mean temperature difference (which would read 30.4, but which need not be taken). The horizontal line drawn from this last point intersects the straight line marked H = 15 (which is $\dfrac{1}{10}$ of the given value 150) at a point, the abcissa of which, read on the horizontal scale, gives 0.00219. Before taking the reading we have divided the given heat exchange coefficient H by 10; therefore the last reading must also be divided by 10, giving 0.000219 as the value of $\dfrac{1}{H} \times \dfrac{1}{tm}$.

This figure multiplied by the number of B.t.u.'s to be transferred per hour, i.e., 1,000,000 will give 219 sq. ft. as the area of the heat transfer surface required.

The mean temperature difference thus calculated applies only to single-pass heat exchangers, for either parallel or counter flow. Nagle[34] points out serious errors that may arise if the logarithmic mean formula is used for multi-pass heat exchangers. The mean temperature difference in the latter case should be calculated from the following formula deduced by Underwood[35]:

$$tm = \frac{b}{\log_e \dfrac{a+b}{a-b}} \quad \ldots\ldots\ldots\ldots (24)$$

where $b = \sqrt{(T_1-T_2)^2+(t_2-t_1)^2} \quad \ldots (25)$

$$a = (T_1+T_2)-(t_1+t_2) \quad \ldots (26)$$

The symbols used are the same as those used in equation (21).

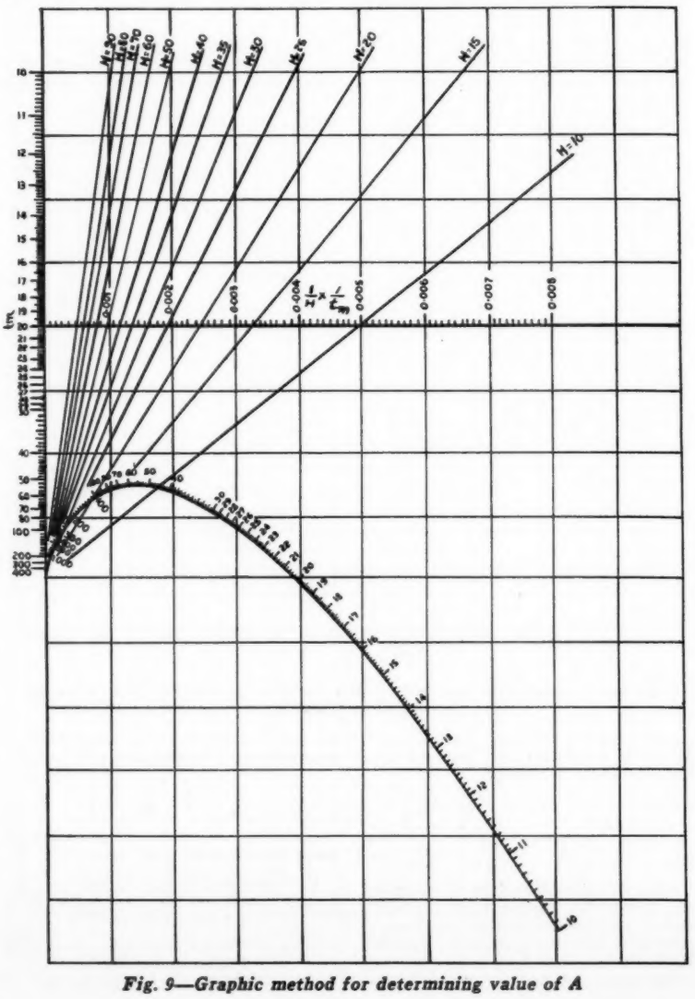


Fig. 9—Graphic method for determining value of A

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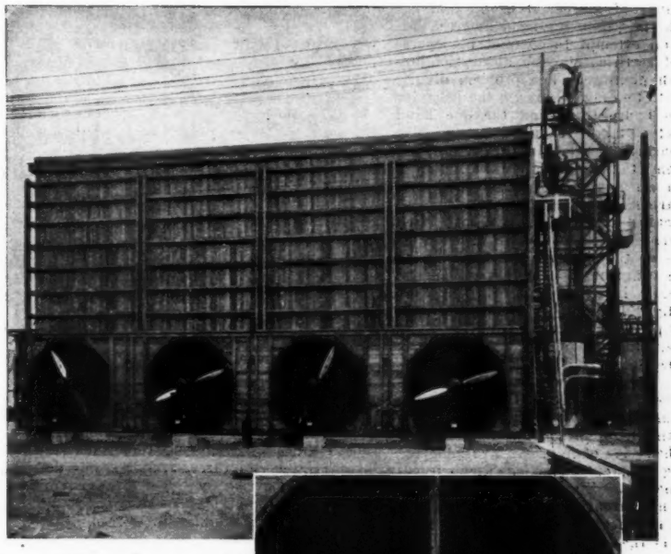

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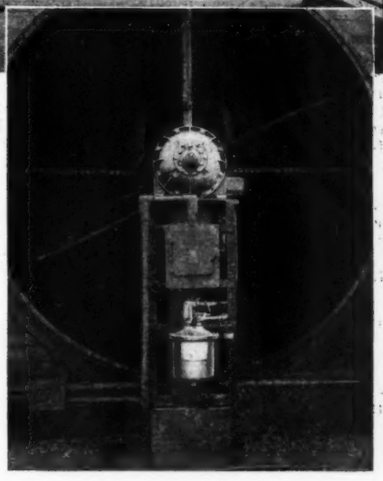
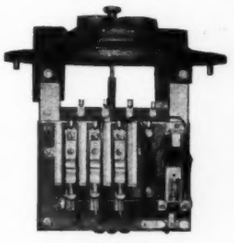


A close-up view of one of the four G-E explosion-proof motors and controllers used in the above cooling tower. Note the simplicity and compactness of this installation



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020-23

GENERAL ELECTRIC

Fugacity of Various Hydrocarbons Above Their Vapor Pressure and Below Critical Temperature

By W. K. LEWIS and W. C. KAY
Massachusetts Institute of Technology.

During recent years both the production and the refinery engineer have become vitally interested in the behavior of hydrocarbons under high pressures, the former in an endeavor to analyze the phenomena of movement of oil and gas through the producing sand and the latter in an attempt to conduct his operations of rectification and absorption under high pressure. The problem divides itself into two major phases, the behavior of pure hydrocarbons on the one hand and that of mixtures on the other. The first marked progress in the general attack on the problem was achieved through an analysis of the behavior of hydrocarbons in general in the light of the so-called reduced equation of state[1]. This furnished a remarkably satisfactory solution of the question of the behavior of pure compounds. Furthermore, thermodynamic interpretation of these data in the light of the so-called solution laws made it possible to predict from the physical characteristics of pure hydrocarbons their behavior in mixtures.[2,3] Unfortunately, however, the prediction necessitated the extrapolation of the data on the pure constituents over a considerable range and the expermental data on the actual behavior of mixtures available for checking this extrapolation was exceedingly meagre. Since that time experimental measurements on the behavior of specific mixtures have been accumulating and it is the purpose of this article to use the more important of these new data to test the validity of the extrapolations already recommended and to carry them further than the most daring extrapolators had hitherto been willing to hazard.

The question at issue is the equilibrium between vapor and liquid mixtures of hydrocarbons. The so-called solution laws in their simplest form calculate this equilibrium from the equation,

$$y/x = P/\pi \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

High pressures cause serious deviations from this rule, but if one will substitute for the pressures P and π in the equation, the fugacity, i.e., the corrected pressure, f_p and f_π, (Eq. 2) the range of validity of the equation is greatly extended.

$$y/x = f_p/f_\pi \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

The work already referred to shows that the ratio of the fugacity to the pressure, $f/_p$, of a hydrocarbon is determined substantially by the reduced pressure P_R and reduced temperature T_R. The relation is shown graphically in Figure 1. In this figure the area above and to the left of the dotted line AB is that determined by the abundant data available on pure hydrocarbons. The area between the dotted lines AB and CB was originally extrapolated from the pure hydrocarbon data just referred to. Physically it cannot be checked by data on pure compounds and in that sense has no significance. However, it was extrapolated originally in the conviction that fugacities read off these curves in this region, used in Equation 2, would make it possible to calculate vapor-liquid equilibrium concentrations satisfactorily. Hitherto there has been practically no data corresponding to the area below the line CB for any curve crossing it.

Application of Data

It is probably safe to say that the only practical use to which one would wish to put the curves to the left of $T_r=1$ is to employ the fugacity values determined from them in Equation 2. Since below the line AB these curves cannot be determined from directly measurable data on the pure hydrocarbons, they must in any event be determined from the characteristics of mixtures, and it seems desirable to define them as determined by the use of Equation 2. However, to do this, since only x and y in this equation are susceptible to direct measurement, some sort of agreement must be had as to the interpretation of both the terms f_p and f_π. f_p, insofar as it characterizes a pure liquid hydrocarbon at the temperature in question, is not only subject to direct measurement but the data for determining it are relatively abundant and dependable. Its value changes with the total pressure and with the composition of the liquid mixture in which it is a constituent. None the less, for hydrocarbons this correction is in most cases small relative to the tremendous variations in the fourth term of the equation, f_π. Furthermore, while the value of f_p in the liquid mixture can be determined from measurable physical characteristics of it, the data for this determination are almost never available. Tentatively, therefore, it is suggested to ascribe to the term f_p its value for the pure liquid component at the temperature in question, uncorrected for other influences. This assumption makes all terms in equation 2 except f_π subject to experimental determination, direct or indirect, making it possible to solve for f_π. Whether such an assumption is allowable must be determined by the arbitrament of the facts.

Two sets of data have appeared recently[6,7,8] which make it possible to test this method of calculation of vapor-liquid equilibrium at higher pressures and lower temperatures than was hitherto possible. The calculations are tabulated below (Table I). It will be noted that the ratio of the concentration of the constituent in question in the vapor to the equilibrium concentration in the liquid, y/x, deviates in no case more than 20 per cent from the value of this ratio, f_p/f_π, calculated from the curves. Furthermore, the average deviation observed from the values is much lower than this, a little over 5 per cent. The values of the temperature, T, the total pressure, π, and the vapor-liquid compositions, x and y, are experimentally determined. As appearing in the tables they were read off the smooth curves representing the experimental data. π_r was obtained by dividing the total pressure by the critical pressure and P_r and T_r similarly. f_p/f_π values are read off the curves of Figure 1. The calculation of the remaining columns is self-evident.

Down to the line AB, the curves of Figure 1 are those hitherto employed[5]. They are based experimentally on the data of pure hydrocarbons. Below and beyond the line AB the curves have been extrapolated further in the light of the data here presented. The wide range of the data and the smoothness of the extrapolation of the original curves make one feel justified in using these curves as the best method today available for the calculation of vapor-liquid equilibrium in hydrocarbon mixtures under high pressures.

With respect to a component above its own critical temperature, it has been suggested[5] to use Equation 2, in which under these conditions f_π is readily determined from the properties of pure substances and x and y are known experimentally, permitting the calculation of f_p. This would be equivalent to defining the fugacity of the component as a liquid, despite the fact that its temperature is

(Continued on Page 114)

TABLE 2
Fugacity of CH_4 in the liquid;

		T_C=191° K.,	P_C=45.8 atm.,	T=20° C.,	T_R=1.532			
π	π_R	f_π/π	f_π	y	x	y/x	f_p
10	0.218	0.987	9.87	0.132	0.008	1.65	163
30	0.655	0.957	28.7	0.619	0.116	5.33	153
50	1.092	0.925	46.3	0.714	0.236	3.02	140
70	1.53	0.895	62.6	0.736	0.363	2.03	127
90	1.968	0.865	77.9	0.714	0.524	1.36	106.1
			T=40° C,	T_R=1.64			
15	0.328	0.982	14.7	0.079	0.007	1.13	166
30	0.655	0.967	29.0	0.451	0.092	4.90	142
50	1.092	0.947	47.4	0.592	0.208	2.85	135
70	1.53	0.925	64.6	0.622	0.329	1.89	122.5
90	1.97	0.902	81.1	0.593	0.506	1.17	95.1
			T=55° C.,	T_R=1.72			
20	0.436	0.985	19.7	0.037	0.005	7.40	146
30	0.655	0.975	29.2	0.292	0.055	5.31	155
50	1.092	0.956	47.8	0.470	0.167	2.81	135
70	1.53	0.935	65.5	0.524	0.292	1.79	117
80	1.75	0.925	74.0	0.501	0.375	1.34	99
			T=70° C.,	T_R=1.796			
30	0.655	0.977	29.3	0.103	0.021	4.91	144
50	1.092	0.972	48.6	0.336	0.130	2.58	126
65	1.42	0.965	62.6	0.392	0.241	1.625	102
			T=80° C.,	T_R=1.85			
25	0.764	0.979	34.2	0.085	0.020	4.25	145.2
50	1.092	0.975	48.7	0.243	0.106	2.20	107
60	1.310	0.972	58.4	0.273	0.183	1.49	87.1
			T=90° C.,	T_R=1.90			
40	0.874	0.987	39.4	0.044	0.010	4.4	173
50	1.092	0.982	49.1	0.152	0.069	2.21	108.2

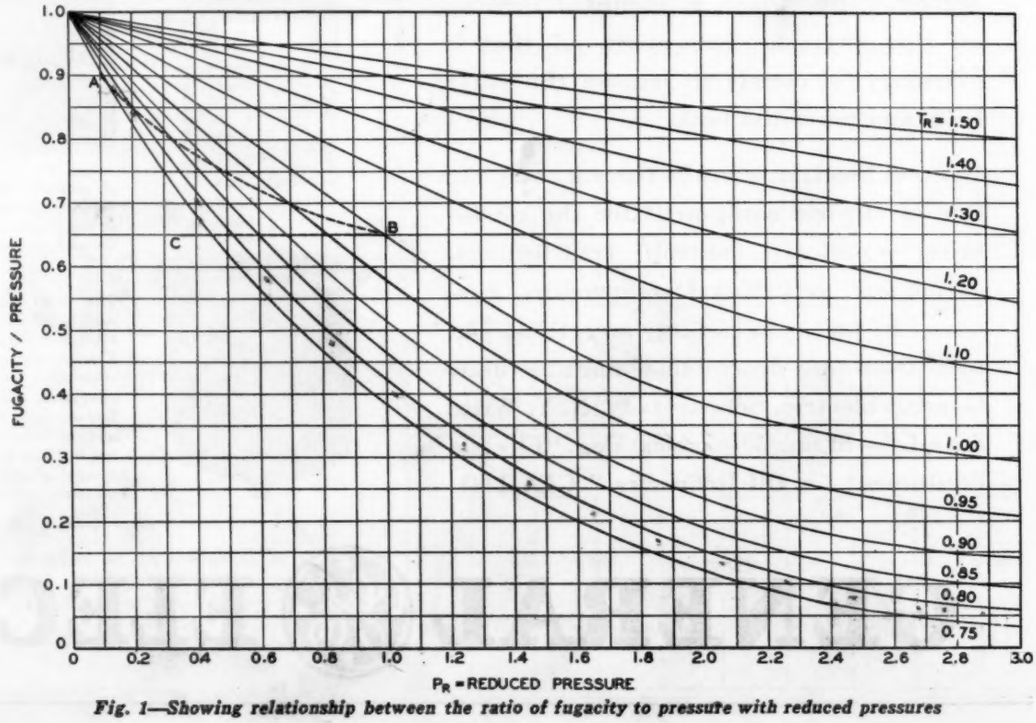


Fig. 1—Showing relationship between the ratio of fugacity to pressure with reduced pressures

Volume of Excess Air in Furnace Combustion Chamber Greatly Affects Amount of Work

By A. G. DAVIS
Simms Petroleum Co.

Efficiency and economy in the operation of steam boilers has long been a matter of vital importance to the engineer and his study of this problem has suggested a great variety of designs with respect to the arrangement and extent of the heating surface, setting and types of burners best fitted for the particular fuel to be burned.

The object has been to reduce fuel costs to a minimum and at the same time retain a maximum of evaporation per square foot of boiler surface. The possibilities of attaining the nearest approach to perfect combustion calls for use of a volume of air containing just the proper amount of oxygen to combine with the fuel and no more.

As air contains about 21 per cent oxygen and 79 per cent nitrogen, the latter being inert and taking no part in the combustion whatever, it can be readily seen that the requirement of oxygen over and above that actually uniting with the fuel causes the volume of excess air to increase very rapidly as each 1 per cent increase in oxygen in excess of requirements means an increase of 3.78 per cent of the inert gas nitrogen or a total of 4.78 per cent increase of excess air.

Suppose for example gas were used as fuel and this gas were methane (CH_4). For perfect combustion, without the use of any excess air, the result can be stated as follows:

$$CH_4+2O_2+7.56N_2=CO_2+7.56N_2+2H_2O$$
(9.56 vol. air)

If now as little as 15 per cent excess air is added the equation is changed to read:

$$CH_4+2.3O_2+8.7N_2=CO_2+0.3O_2+8.7N_2+2H_2O$$
(11 vol. air)

The use of this 15 per cent excess air increases the actual volume of air per volume of gas from 9.56 volumes to 11 volumes, or, stated another way, adds 1.44 cubic feet of air for each cubic foot of gas used, as a dead load that must be heated to the temperature of the firebox.

For each 1,000 cubic feet of fuel gas this dead load amounts to 1,440 cubic feet or 109 pounds and will require the use of about 70 cubic feet of fuel gas in addition to the 1,000 cubic feet to raise the excess air to a firebox temperature of 2,200° F.

For various reasons such as the inability to obtain a perfect mixture of fuel and air, insufficient time for the combustion to complete itself before the products of combustion come in contact with the relatively cold surface of the boiler tubes causing a deposition of soot, it is necessary to allow the presence of some excess air, 15 per cent to 20 per cent being considered good practice.

As a result of these studies there has arisen in the power field a set of standards for the consumption of fuel which are very exact and can be followed closely.

In the refining industry the picture presented is somewhat different as the attempt to attain efficiency and economy in the consumption of fuel in the heating of oil for purposes of distillation has become a standard practice only comparatively recently.

In the early days of the industry practically all oil was distilled by bringing it to the boiling point in a shell still set directly over a firebox in which coal or oil or gas was burned more or less according to the fancy of the stillman who happened to be in charge and as the object was to transfer the heat to the oil in the still it was considered good practice to have the fire as close to the under surface of the still as possible.

This resulted, of course, in overheating that portion of the shell of the still directly over the fire which in turn caused the failure of many still bottoms and the deposition of considerable carbon due to the oil coming in contact with the highly heated surface, so that stills were gradually raised and the fireboxes considerably enlarged in order to obtain better distribution of heat.

With the advent of the pipe still and the cracking coil it was found that heat could be added much more rapidly through the walls of tubes than was safe in shell stills and the designing of furnaces for the application of heat to the oil flowing through the coil became more exact.

Many engineers with experience in the power field naturally supposed that the standards used in steam generation could be moved over bodily into the petroleum industry and with this in mind many early installations were made in which it was attempted to burn fuel with the use of high firebox temperatures and very small amounts of excess air.

It was found, however, due to the fact that oil could be overheated, particularly in some of the later stages of the cracking operation, that it was impossible to design from a fuel efficiency standpoint alone, but that some provision had to be made to permit the rate of heating to be controlled in different parts of the coil depending upon the condition of the oil in the particular portion of the coil under consideration, some sections being able to absorb heat very rapidly, whereas other sections required that this rate be diminished.

In order to accomplish this shifting of the load or the relative rapidity of heat absorption to or from any particular part of the coil in installations already made, excess air was found to be a very valuable agent.

To illustrate more clearly, it might be well to take as an example the well-known "box type" furnace so widely used by a number of designers, in which the coil is divided into sections by the placing of a bridge wall between the firebox and certain banks of tubes and causing the products of combustion to be drawn down through these tube banks but not exposing them to the radiant heat of the firebox.

In this type of furnace the firebox is rectangular in shape and tubes which are suspended from the roof or hung on the side walls are exposed to the radiant heat of the firebox and to some extent also to heat of convection where they come in contact with the products of combustion passing over the bridge wall.

Since the bulk of the heat absorbed in these tubes is by means of radiation, this portion of the coil will be referred to as the radiant section as contrasted with the convection section which is placed behind the bridge wall.

In many furnaces this section consists of two parts, the top part receiving the oil after it has passed through the radiant tubes and conducting it downward, concurrent with the flow of the products of combustion through the bank, to a point of exit from the furnace by way of the transfer line, and may be designated as the afterheater or soaking bank.

The lower part of this section is located below the soaking bank and receives the oil as it first enters the furnace and conducts it upward, countercurrent to the flow of products of combustion, finally delivering it to some portion of the radiant section and is known as the preheater bank.

The products of combustion pass up over the bridge wall from the firebox and are then drawn down through the convection section by means of a stack, the base of which is connected to the back of the furnace at a point below the entrance of the oil into the preheater bank.

In a furnace of this type the infiltration of air through the roof or the walls of the furnace causes much more trouble than is the case with a simple up-draft furnace where the furnace itself is really a part of the stack and, if desired, infiltration of air through the setting can be prevented by carrying a slight positive pressure.

However, in the box type furnace air introduced as infiltration through the roof or walls does no good whatever as it does not enter into the combustion nor does it pass through the firebox and thus reach the temperature of the products of combustion, but acts as a positive drag on the operation by chilling the products of combustion, thus rendering them less effective as a heating medium by virtue of the decreased temperature difference between these products of combustion and the oil in the tubes to be heated.

Air Infiltration

In addition to this drag on the operation by lowering the temperature, air infiltration through the setting has a more serious effect in causing the draft to be cut down at the top of the bridge wall. The draft at this point must be induced by the stack in opposition to the "stack-effect" of the furnace itself, the tendency being for the products of combustion to continue their upward travel, after pass-

OPERATING DATA UNDER CONDITION NO. 1

Oil Temperatures		Furnace Temperatures	
Enter preheater	345° F.	Bridge wall	1,450° F.
Enter roof bank	608	Flue	615
Enter soaking bank	730	Stack draft	—0.58" water
Transfer line	885	Dampers partly closed. Air openings cons.ricted.	

Throughput: 3,000 bbls. per 24 hours = 37,800 lbs./hr.

				B.t.u./hr.	Work
Preheater	(37,800)	(608-345)	(0.69)	6,860,000	43.3%
Roof	(37,800)	(730-608)	(0.825)	5,370,000	33.9
Soaking bank	(37,800)	(885-780)	(0.91)	3,610,000	22.8
Total				15,840,000	100.0%

This was the condition under which the unit was found to be operating, the only change that had been made from the former operation being the raising of the throughput from 2,000 bbls. per 24 hours to 3,000 bbls. per 24 hours.

CONDITION No. 2

Oil Temperatures		Furnace Temperatures	
Enter preheater	370° F.	Bridge wall	1,400° F.
Enter roof	630	Flue	660
Enter soaking bank	790	Stack draft	—0.54" water
Transfer line	885	Dampers partly closed. Air openings increased.	

Throughput: 3,000 bbls. per 24 hours = 37,800 lbs./hr.

				B.t.u./hr.	Work
Preheater	(37,800)	(630-730)	(0.705)	6,940,000	45.5%
Roof	(37,800)	(790-630)	(0.830)	5,025,000	32.9
Soaking bank	(37,800)	(885-790)	(0.910)	3,270,000	21.6
Total				15,235,000	100.0%

The only change made from Condition No. 1 was an increase in the air openings adjacent to the burners which lowered the bridge wall temperature sufficiently to continue the run.

CONDITION NO. 3

Oil Temperatures		Furnace Temperatures	
Enter preheater	395° F.	Bridge wall	1,380° F.
Enter roof	660	Flue	700
Enter soaking bank	792	Stack draft	—0.60" water
Transfer line	885	Dampers wide open. Air openings increased All charging oil through tower coil.	

Throughput: 3,000 bbls. per 24 hours = 37,800 lbs./hr.

				B.t.u./hr.	Work
Preheater	(37,800)	(660-395)	(0.725)	7,250,000	49.5%
Roof	(37,800)	(792-660)	(0.845)	4,210,000	28.7
Soaking bank	(37,800)	(885-792)	(0.910)	3,200,000	21.8
Total				14,660,000	100.0%

Between Condition No. 2 and Condition No. 3 the unit was shut down and the furnace thoroughly gone over, all possible points of air infiltration being covered with plastic material to insure the setting being air-tight, the dampers were opened wide and the air openings increased until the draft over the bridge wall was reduced to —0.05 inch water. The readings for Condition No. 3 were taken shortly after the unit went on stream.

CONDITION NO. 4

Oil Temperatures		Furnace Temperatures	
Enter preheater	410° F.	Bridge wall	1,370° F.
Enter roof	680	Flue	700
Enter soaking bank	800	Stack draft	—0.67" water
Transfer line	885	Dampers wide open. Air openings same as No. 3. All charging oil through tower coil. Other units on same stack.	

Throughput: 3,000 bbls. per 24 hours = 37,800 lbs./hr.

				B.t.u./hr.	Work
Preheater	(37,800)	(680-410)	(0.735)	7,500,000	52.5%
Roof	(37,800)	(800-680)	(0.855)	3,880,000	27.0
Soaking bank	(37,800)	(885-800)	(0.915)	2,940,000	20.5
Total				14,320,000	100.0%

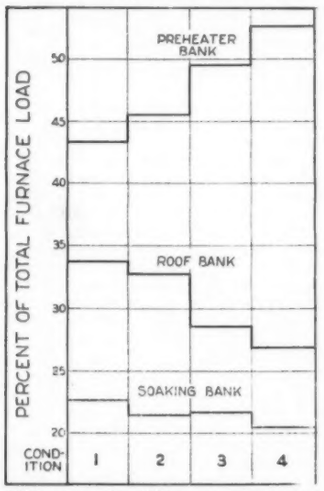
The readings for this condition were taken after the unit was well on stream and are representative of settled operation to the completion of the run. The redistribution of the load as a result of the changes described are shown on the accompanying diagram.

ing over the bridge wall, instead of passing down through the convection section. Consequently a leak in the setting, particularly in the roof or back wall or around the doors covering the header box housing, is very troublesome since it neutralizes the slight negative pressure (—0.05 inch to —0.1 inch water) existing over the bridge wall for good operation and tends to build up a positive pressure at this point. Since a building up of the pressure at this point cuts down the volume of air entering with the fuel, the firebox temperature tends to rise and, since the proper amount of heat is not being absorbed in the convection section due to the air infiltration, more fuel is required to bring the oil to the final temperature desired, which, in turn, tends to build up still more positive pressure over the bridge wall.

A vicious cycle is thus set up and when the conditions become severe enough local overheating results with consequent tube failure as well as more rapid deterioration of the furnace roof and walls and the damage incurred from the ruptured tube.

For this reason precautions cannot be too thorough to prevent air infiltration, as its absence or presence quite often means the difference between satisfactory and unsatisfactory operation. All possible sources of leakage therefore should be thoroughly stopped by the use of some plastic material and draft gauge readings at various points in the furnace should be made a part of the regular procedure together with frequent inspection to insure tightness.

Another important point to be considered is the stack, which should be some-



Effect on the different tube banks in a pipe still as volume of air under the still is altered

what oversize so that it is not necessary under ordinary operation or with clean tubes to run with the damper wide open.

When all leakage through the setting has been stopped, and with a stack adequate for the purpose, it is possible to shift a part of the load being carried in any particular section of the furnace to some other section by increasing or decreasing the percentage of excess air.

Cracking Coil

Oil in the process of cracking becomes progressively sensitive to overheating as its temperature approaches and enters the range in which it cracks. Whether this tendency, which is not of the same magnitude for all types of cracking stock, is due to high tube wall temperature or lack of sufficient velocity of the oil or oil vapors through the tubes or a combination of these and other factors does not particularly concern us here since we are still faced with the fact that such a tendency does exist, the purpose here being to point out one relatively simple method of relieving the condition by slowing down the heat absorption in the sensitive stages.

Pipe still and cracking unit furnace designers now allow for this characteristic in the oil being heated, by properly proportioning the tube surface in each of the various banks in order to avoid overheating even in the sections where the tubes are exposed to the radiant heat from the firebox.

However, in furnaces of older design where sufficient consideration was not given to such matters the conditions may very often be greatly improved and the equipment held on stream for a greater length of time by the judicious use of excess air.

A recital of the results obtained on one installation which was improved in this manner may serve to illustrate the point more clearly than a description alone.

At this plant several cracking units were connected by breeching to a common stack and in operation with a normal, rated throughput but with the use of a minimum amount of excess air experienced failure of tubes in the roof of the radiant section with distressing regularity. These furnaces were gone over thoroughly to insure tightness and prevent air infiltration, the dampers in the breeching leading to the stack were opened wide and the openings for air adjacent to and underneath the burners were increased.

The net result was to raise the proportion of work done in the preheater section from 43.3 per cent of the total as found at the beginning of this experiment to 52.5 per cent and to lower the work done in the roof or radiant bank from 33.9 per cent of the total to 27 per cent and also to lower the amount of work done in the afterheater or soaking bank from 22.8 per cent to 20.5 per cent.

In addition to this it was possible to lower the bridge wall temperature from 1,450° F. to 1,370° F., which meant a lower firebox temperature and reduced the radiation therefrom.

Operating results

There was also an increase in yield of pressure distillate due to the fact that the oil was brought more quickly to the cracking temperature and held for a greater length of time in the furnace tubes under cracking conditions. The units were enabled to remain on stream for a greater length of time and the former tube failures practically disappeared.

The accompanying tables show in detail the temperatures entering and leaving the various banks of tubes in this furnace under several methods of operation.

As will be observed from the accompanying tables, the temperature of the oil at the inlet to the furnace increased gradually as the various changes were made from 345° F. to 410° F. The reason for this increase in temperature was the fact that as the oil was raised more quickly to the cracking temperature and consequently was held longer in the furnace tubes under cracking conditions the yield of pressure distillate increased and more cooling was required in the bubble tower. This cooling was accomplished by means of a coil in the top of the tower through which the cold charge was pumped on its way to the furnace.

This increase in temperature at the furnace inlet reduced the total load which the furnace was required to handle, but it will be observed that not only did the per cent of total work done increase in the preheater bank but the actual heat input in this bank increased from 6,860,000 B.t.u./hr. to 7,500,000 B.t.u./hr.

Effect of Excess Air

In conducting experiments with the use of excess air it is well to bear in mind the following factors, each of which has an important bearing on the results obtained.

1. The temperature of the products of combustion at the base of the stack affect the draft pull on the furnace, the higher the temperature the greater the pull.

2. Infiltration of cold air through the furnace walls or roof cool the products of combustion sweeping over the convection banks and also tends to cut down the draft pull over the bridge wall and build up a positive pressure at this point.

3. When positive pressure exists over the bridge wall the products of combustion pass more slowly through the convection section and also tend to short-circuit as they pass over the bridge wall and consequently do not properly sweep over the thermocouples which usually project into the furnace from the rear wall. This gives an erroneous temperature reading and does not truly reflect the firebox temperature. In any case, unless velocity couples are used, the temperature readings over the bridge wall are lower than the actual temperature of the products of combustion but when a large volume of these products is drawn rapidly over the bridge wall under the proper draft conditions there is a smaller differential between the temperature as noted and the temperature of the firebox. The lower firebox temperature of course reduces the radiation from the firebox to the roof or wall tubes.

4. The oil leaving the preheater bank and entering the radiant bank being raised to a higher temperature causes a reduction in the temperature difference between the oil in the radiant tubes and the heat in the firebox which also tends to reduce the heat pickup in these tubes.

5. Causing the oil to enter the soaking bank at a higher temperature allows it to be exposed to soaking at a higher average temperature, more heat being available for cracking since the sensible heat requirements are cut down.

6. The capacity of a furnace may be gauged by either the point where positive pressure develops over the bridge wall or when a reduction of the load being carried in the radiant bank causes an increase in the soaking bank load instead of being transferred to the preheater bank.

Estimation of Oil Losses in Petrolatum From Centrifuges During Dewaxing

By L. W. HODUS
Canfield Oil Co.

In the operation of a centrifuge plant for the dewaxing of long residuum or bright stock, it is sometimes desirable to estimate the amount of bright stock or oil which is retained in the petrolatum. This information is usually obtained, by refiners, by comparing the amount of petrolatum produced from month to month; a procedure which is reliable over long periods of time but which fluctuates with variations in petrolatum content of the crude and is therefore not reliable for short, experimental runs. In an effort to devise some scheme for comparison of petrolatum as to oil content, the following method was used.

The method is based upon the assumptions: (1) That the petrolatum consists of an oil which is similar to the bright stock normally produced; and an indefinite "dry wax" which contains the more or less crystalline waxes; (2) that the oil or bright stock is in solution with all of the naphtha which is present in the dilute petrolatum as it leaves the centrifuge, while the "dry wax" holds none of the naphtha.

The strict validity of these assumptions may be attacked but, for purpose of comparison of plant results, the assumptions are justified.

In order to apply the method, concurrent samples are obtained which represent the dilute wax-free oil and the dilute petrolatum coming from the centrifuges. The gravity of each of the two samples is taken. About 500 cc. of each sample is distilled, preferably in a partial vacuum, until all of the naphtha has been driven off. The amount of charge, of naphtha recovered, and of residue is determined by weight conveniently and converted into volume from the gravity data on the separated materials.

Having determined the amount of naphtha and of oil in the dilute wax-free oil sample, it is now assumed that the naphtha in the petrolatum carries with it a corresponding amount of oil. Having computed the amount of oil which corresponds to the naphtha content of the dilute petrolatum, the remainder of the petrolatum is regarded as dry wax. It is important, however, to make a correction for loss of naphtha from the dilute petrolatum due to the evaporation caused by the hot carrier water. This correction may be determined by experiment by allowing some of the actual naphtha to evaporate, at carrier liquid temperatures, and determining the gravity of the residual naphtha at various percentages evaporated. An approximation for 60° A.P.I. naphtha is 1 per cent by volume of the naphtha lost for every 0.1° A.P.I. by which the naphtha recovered from the dilute petrolatum is heavier than the naphtha recovered from the dilute wax-free oil.

In order to illustrate the method, an example is given in Table 1.

	Wgt. gms.	Grav. °A.P.I.	Sp. gr.	Cal. cc.
Petrolatum recovered	200	32.3	.8629	231
Naphtha recovered ..	193	61.6	.7328	263
Naphtha distillation loss	4	....	.....	6
Dilute Petrolatum charge	397	46.6	.7945	500

Total naphtha present in dilute petrolatum is 193 plus 4 or 197 grams which is equivalent to 263 plus 6 or 269 cc. Hence the specific gravity of the naphtha in the dilute petrolatum (as sampled) was 197/269 or .732 which is 61.8° A.P.I. This is 0.5° A.P.I. heavier than the corresponding naphtha recovered from the dilute wax-free oil, hence the hot water in the centrifuge must have caused the evaporation of about 5 per cent of the original naphtha leaving only 95 per cent in the dilute petrolatum sample. The 263 cc. of naphtha recovered from the dilute petrolatum plus the 6 cc. distillation loss (total 269 cc.) is therefore only 95 per cent of the naphtha present in the dilute petrolatum as it leaves the centrifuge bowl, hence the corrected naphtha should be 269/.95 or 283 cc. of naphtha oripinally present with the 231 cc. of petrolatum. From this, the composition of the dilute petrolatum leaving the centrifuge bowl may be computed:

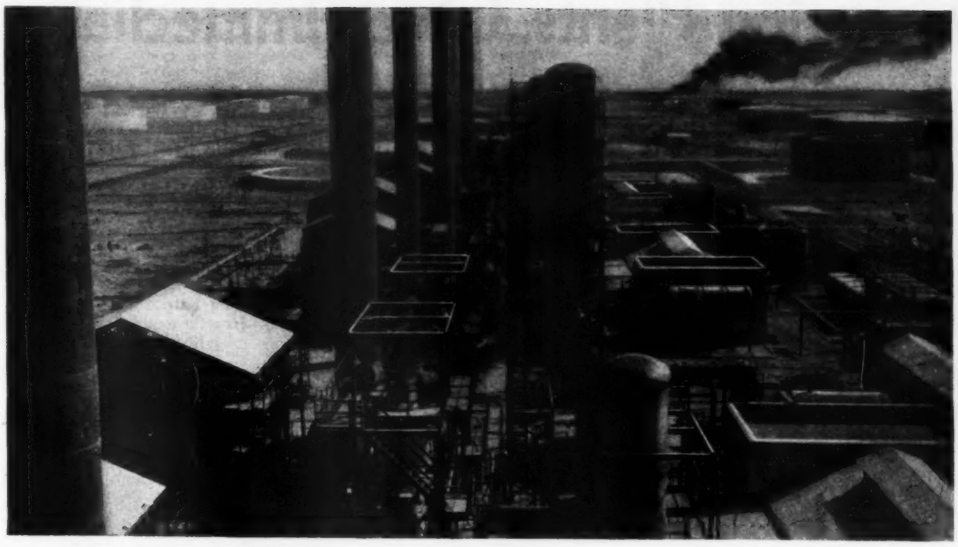
	cc.	Per cent volume
Petrolatum	231	44.9
Naphtha	283	55.1
Total	514	100.0

Now, since the dilute wax-free oil solution contains 30.4 parts of oil for every 69.6 parts of naphtha, the 55.1 parts of naphtha in the dilute petrolatum should carry with it $\frac{30.4}{69.6} \times 55.1$ or 24.0 parts of oil. But this oil is part of the petrolatum of which there are 44.9 parts consequently the composition of the petrolatum is $\frac{24.0}{44.9} \times 100$ or 53.5 per cent wax-free oil and 46.5 per cent "dry wax."

TABLE 1—METHOD FOR DETERMINING LOSSES

	Weight grams	Grav. °A.P.I.	Sp. gr.	Calc. cc.	Volume per cent
Wax-free oil recovered	137	27.9	.8877	154	30.4
Naphtha recovered	249	62.2	.7305	341	69.6
Naphtha distillation loss	8	....	.....	11	
Dilute wax-free oil charge	394	50.2	.7788	506	100.0

Total naphtha present in dilute wax-free oil is 249 plus 8 or 257 grams which is equivalent to 341 plus 11 or 352 cc. Hence the specific gravity of the naphtha in the dilute wax-free oil was 249/352 or .730 which is 62.3° A.P.I.



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Will Spend $5,000,000 for Solvent Extraction and Dewaxing Plants Over Immediate Future

By W. T. ZIEGENHAIN

A race among refiners to improve the V.I. number of their lubricating oils by solvent extraction appears to be off to a good start. It promises to be second only to the octane race in motor fuels still in progress. Construction work now under way and definitely projected to start within the next three months calls for an expenditure of at least $5,000,000 for equipment and chemicals. These plants are being built at widely scattered points as shown in the accompanying table.

In all cases, the companies are going into the problem without awaiting complete settlement of all differences of opinions regarding patent claims and with problems to be worked out of a highly technical nature before maximum yields may be expected. They are willing to undertake the work, however; first, because they know the principle is sound, and second, because competition is driving them into it.

The rivalry which is fast developing is restricted to the larger units for the time being, not because the solvent process is applicable only to the larger units, but because that group has more at stake in the highly competitive and yet profitable lubricating oil business.

The California refiner sees in the new development a chance to make his oil compare with Pennsylvania oil in viscosity index, the Gulf Coast and Mid-Continent refiners have the same thought and now the Sinclair Refining Co. is hurrying through a construction program at its Wellsville, N. Y., refinery to process Pennsylvania grade crude and produce lubricants with Pennsylvania viscosity index plus.

Looking further into this matter of improving lubricating oil quality it will be seen that solvent extraction will allow refiners in general to approach or equal the quality of hydrogenated oils.

This race to improve viscosity index, reduce the carbon residue and improve the cold test of motor oils probably would have started a year or two ago except that refiners generally have been curtailing all avoidable cash commitments.

Status of Solvent Extraction and Dewaxing Plants in Refineries

UNITS NOW UNDER CONSTRUCTION

Company—	Refinery location—	Kind of solvent—	Capacity of finished oil daily (bbls.)	Status of construction (per cent complete)
Atlantic Refining Co.	Philadelphia, Pa.	Acetone—benzol dewaxing with nitrobenzene extraction	1,000	Dewaxing 50% Extraction 95%
Gulf Refining Co.	Girard Point, Pa.	Propane—cresylic acid (Duo Sol)	1,500	20%
Magnolia Petroleum Co.	Beaumont, Tex.	Propane—cresylic acid (Duo Sol)	2,200	50%
Sinclair Refining Co.	Wellsville, N. Y.	Nitrobenzene—sulphuric acid	800	40%
Standard Oil of New Jersey	Bayonne, N. J.	Phenol	1,000	10%
Union Oil Co.	Oleum, Calif.	Sulphuric acid—benzol (Edeleanu)	1,500	85%
Vacuum Oil Co.	Paulsboro, N. J.	Propane—cresylic acid (Duo Sol)	1,500	50%

UNITS IN OPERATION

Company—	Refinery location—	Kind of solvent—	Daily capacity finished oil (bbls.)	In operation:
Imperial Oil Co., Ltd.	Sarnia, Ont., Canada	Phenol	2,000	3 years
Indian Refining Co.	Lawrenceville, Ill.	Acetone—benzol dewaxing with furfural extraction	800	1 year
Mid-Continent Petroleum Corp.	Tulsa, Okla.	Dichloroethyl ether (Chlorex)	150	1 year
Shell Oil Co. of California	Martinez, Calif.	Sulphuric acid—benzol (Edeleanu)	500	....
Standard Oil Co. (Indiana)	Casper, Wyo.	Dichloroethyl ether (Chlorex) extraction with propane dewaxing	500	Extraction plant —1 yr.; dewaxing plant—new
Standard Oil Co. (Indiana)	Wood River, Ill.	Dichloroethyl ether (Chlorex) extraction with propane dewaxing		....
Standard Franco-Americaine de Raffinage	Port Jerome, France	Phenol	3,500	3 months

UNITS UNDER CONSIDERATION

Company—	Refinery location—	Kind of solvent—	Actual construction—
Mid-Continent Petroleum Corp.	Tulsa, Okla.	Enlargement of present Chlorex plant	Indefinite
Standard of California	Richmond, Calif.	.....	Probable
Continental Oil Co.	Ponca City, Okla.	Trying several in pilot plant	Indefinite
Empire Oil & Refining Co.	Ponca City, Okla.	.....	Not immediately
Shell Petroleum Corp.	.....	All phases of work being studied	.....
Texas Co.	Port Arthur, Tex.	Furfural—pilot plant operating	.....
Sun Oil Co.	.....	Propane dewaxing	.....
Standard Oil of Louisiana	Baton Rouge, La.	Phenol	Probable
Humble Oil & Refining Co.	Baytown, Tex.	Phenol	Probable

Not a New Idea

Solvent extraction plants for the separation of the paraffinic and naphthenic hydrocarbons together with the use of selective solvents for dewaxing are not new to the industry. The Indian Refining Co. at Lawrencevill, Ill., has operated a commercial sized solvent extraction plant for more than five years. One, two and three years' experience stands behind several of the other companies definitely identified in the development work at present but it has only been within the past year that the problem has received general attention. The Edeleanu process has been used on kerosene for many years.

Many refiners who are giving time and thought to building a unit some day have preferred to see the routine developed elsewhere and have chosen not to build pilot plants. Because there are many companies in that position and because so much work is now in progress among refiners and equipment manufacturers, it seems only reasonable to expect a doubling or trebbling of the above list of solvent plants before another year passes.

This of course is contingent upon a continuation of the general economic recovery and a genuine need for better motor oils.

Some refiners have dispensed with the problem for the time being by stating that the present-day motors do not need better lubricants than are now generally available. The same agument was advanced at the beginning of the octane race also. It was soon learned, however, that automobile manufacturers took advantage of the better motor fuels available and through increased compression ratios gradually outlawed low octane motor fuel. The octane value of the average gasoline was forced up despite all the objections raised. It never was decided whether the refiner simply played into the hands of the automobile engineer or helped his own position by lessening the supply of motor fuel, but the experience does offer a suggestion as to what to expect in this movement.

Operating Conditions More Severe

To say that cars of modern design need better lubricants than the cars of a few years ago seems a logical conclusion after reviewing the changes that have come about in design.

According to "Automobile Industries" of March 10, 1934, page 305, the average American passenger car engine is shown to have passed through the following stages of development:

	Average r.p.m.	Compression ratio	Piston speed ft./min.
1927	2,740	4.55	2,150
1928	2,880	4.86	2,210
1929	3,063	4.99	2,310
1930	3,170	5.15	2,380
1931	3,230	5.23	2,395
1932	3,250	5.39	2,390
1933	3,360	5.57	2,463
1934	3,420	5.72	2,508

These data are but suggestions of the needs for lubricants of more constant viscosity, lower pourpoint and freedom from the tendency to produce carbon. It also seems logical that with motor fuels now generally available having an octane value of 70 or higher selling at prices free of any premium, motor car manufacturers will not hesitate to step up the speed of the new engines and to further increase power without increasing weight.

Resume of Work to Date

Once convinced that the movement to improve the quality of motor oils lies in the adoption of some form of solvent extraction, the refiner is faced with having to make a decision as to what one of the many kinds now in use will best fit his needs.

Four years ago there was only one selective solvent process which commanded attention of the refining industry, namely, the Edeleanu process. Since that time, however, the rate of growth and development of other selective solvent processes has been such that some of their ultimate advantages and disadvantages have not yet been recorded. It is quite possible that in the mad scramble for superiority, in the near future some of these solvent processes will be left by the wayside, while others will enjoy a greater degree of popularity than they now have. Moreover, the possibility of the development of still better solvents and more efficient processes should not be lost sight of.

At present the subject is somewhat vague to the nontechnical operator in that little or no distinction of the term solvent is made with respect to a true solvent and the term as applied to the dewaxing processes. A true selective solvent is one which when contacted with a charging stock or distillate produces two separate bases, the raffinate layer and the extract layer. On the other hand, when a so-called solvent is used as a diluent for the purpose of dewaxing a distillate, true solvent action does not take place, and the term selective solvent is somewhat of a misnomer.

Various solvents and combinations of solvents may be used in the refining of lubricating oils. However, to produce optimum results and maximum efficiency, several factors must be taken into consideration. These factors may be enumerated as follows: (1) The selective properties of the solvent. Its affinity for the naphthenic constituents of the oil should be greater than that possessed by the paraffinic constituents, in order to reduce the amount of solvent required. The solvent power for the paraffinic constituents should be low to insure a greater yield of raffinate. (2) The adaptability of the solvent to various types of crudes. (3) Availability and cost of solvent. (4) Chemical stability and method of application of the solvent. (5) Temperature range of application of the solvent to the distillate. (6) Reclamation of the solvent. (7) Physiological and corrosion effects of the solvent.

Summary of Literature

An attempt has been made in the following paragraphs to supply a brief summary of the literature on the subject and a short discussion of each of the

more important processes developed to date as prepared by V. L. Jones, M.S.

Ferris, Birkhimer and Henderson[5] have made an extensive study of the relative efficiencies of known and prospective selective solvents as applied to the separation of lubricating oils into the paraffinic and naphthenic fractions. They adopted as their criteria "the difference in composition of the dissolved and undissolved oil fractions obtained with various solvents a value representing the difference in paraffinicity of the two fractions. The greater the difference, the more selective is the solvent. The paraffinicity or naphthenicity of each fraction was determined with the aid of the expression developed by Hill and Coots" namely

$$a = \frac{G - 0.022 \log (V^1 - 35.5)}{0.755}$$

where a = viscosity gravity constant
V^1 = Saybolt viscosity at 210° F.
G = specific gravity at 60° F.

Thus, the higher the value of "a," the greater the naphthenicity, while lower values of "a" give correspondingly greater values of paraffinicity. They conclude in their work that "There are many indications pointing to a generalization that solvent action is profoundly effected by certain structural characteristics and the presence of certain groups, most of which are usually called play groups." For example, they found that phenol was superior to n-propyl and isobutyl alcohol; they also found that furfural and benzaldehyde were superior to propionaldehyde; and that phenol acetate was more effective than methyl acetate. Moreover, they noted that the efficiency of the solvent decreased as more alaphatic chains were added to the benzene ring. This is demonstrated by the fact that phenol and nitrobenzene are superior to cresylic acid and O-nitrotoluene respectively.

Their works also show that the ratio of the volumes of undissolved oil to the volume of the solvent as a function of the viscosity gravity constant of undissolved oil is practically independent of the temperature of extraction, provided, however, that the temperature is at least 25° C. below the critical solution temperature. From their data it may be concluded that nitrobenzene is one of the most desirable solvents for the treatment of the heavier distillates.

Three General Methods

There are three general methods by which the process of extraction may be effected, namely, (1) single contact extraction, (2) multiple contact extraction and (3) countercurrent contact extraction. In the first method the extraction solvent and oil are contacted in a single stage by agitators. The two phases may be separated by settling and decantation, or by centrifuging. The method may be effected by a batch or continuous operation in which such devices as orifice columns or agitators equipped with revolving paddles are employed. In the multiple contact extraction method the process is the same with the exception that the treated oil of the separation is again contacted with fresh solvent, this operation being repeated as often as necessary to accomplish the desired result. Either continuous or bath operations may be employed. The countercurrent method is as its name signifies, the contacting of the oil and solvent by allowing them to flow countercurrently, either by batch or continuous operation.

The relative efficiencies of the three methods may best be evolved by a consideration of some of the theoretical aspects of the problem. By making use of the distribution law we have

$$\frac{a_1}{a_2} = K \quad \ldots\ldots\ldots\ldots \quad (1)$$

where a_1 is the concentration of the solute in the first solvent, a_2 is the concentration of the solute in a second solvent which is used to wash the first, and in which the solute possesses a greatly increased solubility over that in the first solvent. K is a constant which depends solely upon the temperature. The distribution law also specifies that the two solvent liquids must be completely immiscible. Equation 2, which follows, can easily be derived from equation 1, in which m_1 is the weight of the solute in the liquid before extraction, m_2 is the weight of the solute in the liquid after the first contact extraction, V_1 is the volume of the solute free liquid, and V_2 is the volume of the solute free contacting solvent.

$$M_2 = M_1 \left(\frac{V_1 K}{V_1 K + V_2} \right) \quad \ldots\ldots \quad (2)$$

By means of mathematical induction it can be shown that the core of multiple contact extraction yields the following formula:

$$M_n = M_1 \left(\frac{V_1 K}{V_1 K + V_2} \right)^n \quad \ldots\ldots \quad (3)$$

in which n represents the number of single contacts employed.

In applying equation No. 3 to the continuous or countercurrent method of solvent extraction, the weights and volumes will be expressed by weight and volume rates of flow. The exponent n will as before represent the number of single stage contacts to which the system is equivalent.

Figure 1, which is taken from Nash[6], gives a theoretical comparison of the three methods of solvent extraction where the distribution coefficient K is 0.5. In the case of the multiple contact curve, the volume of solvent used is taken to be that of the liquid treated in each stage. This curve also shows the effect that will be obtained on increasing the total volume of solvent used by increasing the number of contact stages. The three-stage countercurrent curve shows the effect which will be obtained by varying the amounts of solvent used in an equivalent three-stage continuous countercurrent process.

Figure 2, taken from a paper by Ferris and Houghton[10], gives the results as obtained in practice by the use of nitrobenzene as the extraction solvent for a lubricating oil in exactly similar processes as shown in Figure 1. In Figure 2, however, the abcissa represent the viscosity-gravity constant of the raffinate, since it is directly proportional to solute hydrocarbon material not extracted. Thus it is seen that the distribution law permits an accurate analysis and forecast of the best method of extraction procedure to be obtained. While from the standpoint of efficiency the countercurrent process is to be desired, it may perhaps be out of the question due to lack of the proper equipment or the costs of same; in such a case, however, it may be quite possible to employ the multiple contact method by making use of available equipment or a slight modification of the same. The number of variables in such a case are two, namely, the number of possible stages, and the fractional part of the total amount of solvent employed to be used in each stage. Nash[6] has stated that if W is the total volume of solute free treating solvent, and w_1 and w_2, etc., are the fractional parts of W used in the first, second and third stages respectively; then the maximum conditions of extraction are obtained when $w_1 = w_2 = w_3$, etc.

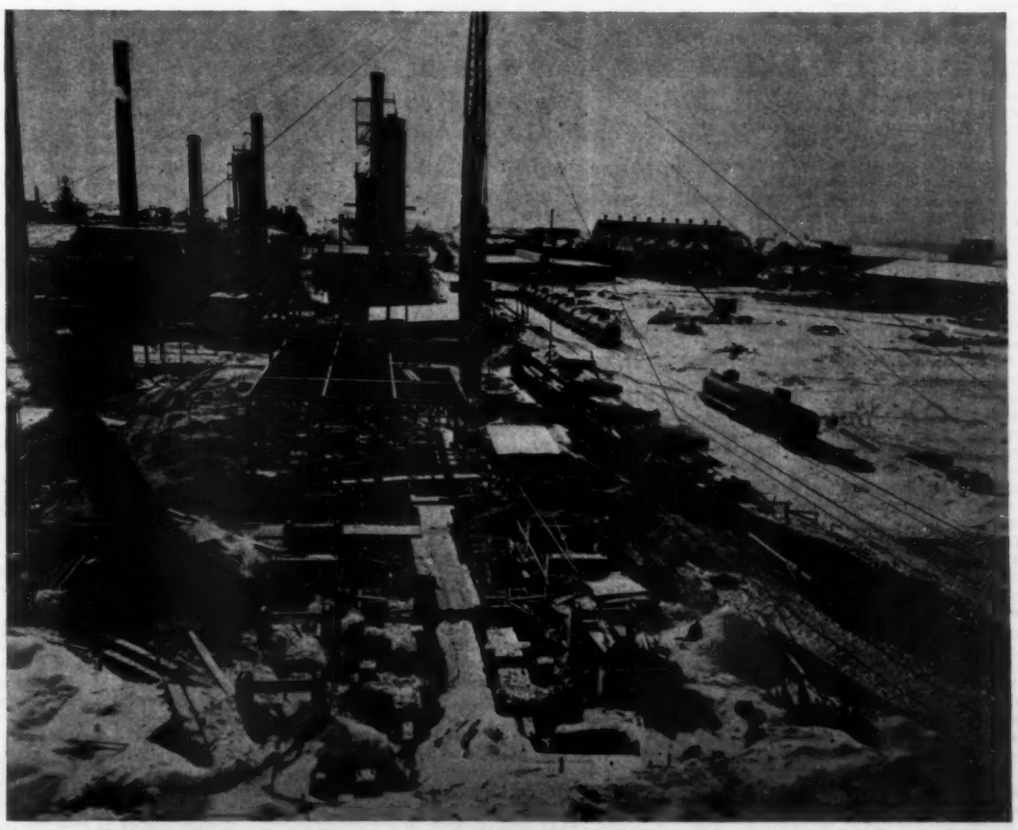
In Figure 3 Nash[6] presents the relative advantages of the countercurrent process over the multiple contact method. Thus, for a countercurrent method which is equivalent to five stages, the complete removal of the solute is approached. Whereas, for a five-stage multiple contact method, about two per cent of the solute remains unextracted. By extrapolating the multiple contact curve it is seen that it would take about 20 stages of multiple contact extraction to be equivalent to five stages of the countercurrent method. In other words, from the standpoint of the number of stages employed, the countercurrent method is about four times as efficient as the multiple contact method.

The question now arises what advantage can be gained by increasing simultaneously the number of stages and the volume of solvent employed. This effect has been shown by Nash[6]. By increasing the volume of solvent the advantage to be gained by increasing the number of stages decreases. The efficiency of any stage regardless of the method employed will necessarily depend upon several factors, among which are the interfaced surface areas of the liquids involved or the time rate of mixing, the amount of solute in the solvent to begin with in the case of the countercurrent process first discussed. It was assumed that in the reclamation of the solvent in this process that all traces of the solute were removed before the solvent was allowed to reenter the cycle of countercurrent extraction. This, however, is very seldom the case. Minute traces of the solute are generally present in the solvent on its re-entering the system. Thus, the efficiency of this particular type of process will depend to a great extent upon the methods used in extracting the solute from the solvent or the regeneration unit of the equipment used.

Sulphur Dioxide Method

Four types of hydrocarbons are recognized in crude oils, naphthenes, paraffins, olefines and aromatics. There also may be found elementary sulphur and sulphur compounds—sulphides, mercaxtans. Other constituents such as nitrogen compounds, phenols, naphthenic acids, resins and asphalt-like compounds. Prior to the advent of the Edeleanu solvent extraction process, the method used to eliminate some of these undesirable constituents from the lubricating oil distillates was the sulphuric acid method. This method had many disadvantages, among which was the uneconomical waste produced and the destructive action of the acid on the desirable constituents of oil. No real progress was made in the way of eliminating the undesirable action of sulphuric acid until 1919, at which time Edeleanu and his co-workers had developed the first successful solvent treating process on a commercial basis, by employing liquid sulphur dioxide. In its initial development as a solvent treating process, it was limited to the treatment of the lighter fractions such as kerosene and gasoline.

The method depends for its basis upon the difference in solubility in liquid sul-



Vacuum Oil Co., Inc., Duo-Sol plant under construction at Paulsboro, N. J., refinery

phur dioxide at varying temperatures of the various desirable and undesirable constituents of the distillate. At reasonably low temperature (10° C.) the higher boiling paraffins, naphthenes and naphthenic acids are insoluble. Aromatics and unsaturated hydrocarbons are miscible at all temperatures and in all proportions. Nitrogenous compounds, sulphur and its compounds and asphaltic constituents are also soluble in liquid sulphur dioxide. However, their solubilities decrease with increasing complexity of the molecular construction.

When the Edeleanu process was first applied to the heavier lubricating oils it did not yield a raffinate of desired quality; it was therefore modified by employing a mixed solvent consisting of liquid sulphur dioxide and benzol. This double solvent resulted in a much greater solvent power for the extraction of the undesirable constituents.

The advantages of the process over the acid treating method are many, one of

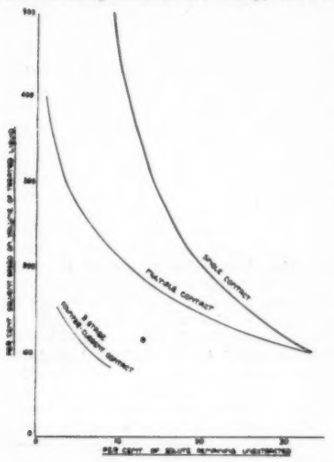


Figure 1

the more important of which is, the removal of nitrogenous and sulphur compounds. It is not possible, however, to remove all of the sulphur and sulphur compounds from a distillate. A little reflection on the law of mass action as applied to solubilities shows that an equilibrium condition will be established between the oil phase and sulphur dioxide phase. However, from available data[1], it will be seen that the following percentages of sulphur and its compounds can be removed from a distillate by the Edeleanu process: West Texas, Pecos, 84.4 per cent; Reagan, 84.4 per cent; Arkansas, 84.3 per cent; Texas Coastal, 66.6 per cent; Oklahoma, 63.6 per cent; California, 63.6 per cent. The physical properties of the reffinate are also greatly improved. A considerable increase in gravity is obtained. The Conradson carbon and sludge values are reduced, and a flatter viscosity curve is obtained. An economical saving is effected by the fact that the residue resulting from the process may be used for fuel oil. The solvent employed is cheap and practically noncorrosive under conditions of operation. The solvent is easily recovered and losses are negligible. The process is adaptable to a continuous semiautomatic method of operation, and it is applicable to any type of changing stock. The only finishing operation required is the filtration through clay. An excellent plant installation is given elsewhere[2], and an admirable description of the earlier developments of the process is given by its inventor.[7]

Phenol Process

While some of the undeveloping principles involved in the phenol process are similar to those of the Edeleanu process, it differs in respect to the later in that the raffinate is distilled from the mixture of the distillate and solvent. If a distillate be agitated with the proper amount of phenol at a temperature slightly above the crystalization point of the latter, and then allowed to stand, two separate layers will form. The heavier layer containing the solvent and solute, and lighter layer the raffinate with some phenol in solution. The amount of unsaturated aromatics and sulphur compounds in the raffinate will be greatly reduced from the amount originally present in the distillate.

The first attempts at developing the phenol process were undertaken about eight years ago with aqueous solutions of phenol. It was not until about 1927, however, that the advantages of dehydrated phenol as applied to the treatment of lubricating oils were fully realized. In May of 1930 a countercurrent installation capable of treating 80 to 90 bbls. per hour was constructed.

The important factors which have a bearing on the improvement of the raffinate in the phenol process are: Proportion of phenol to oil, contacting method, and treating temperature. The temperature factor is confined to the limits of miscibility temperature of the distillate and solvent on one hand and the solidification temperature of the mixture on the other. By increasing the temperature a better grade of raffinate results, but the yield decreases. A similar effect is obtained by increasing the proportion of phenol to oil. The optimum conditions in so far as these two factors are concerned depend to a great extent upon the properties of the distillate and the degree of improvement sought. The countercurrent method of contacting the phenol and oil is adaptable to the process.

An improvement in the following properties of the lubricating oil has been found to result from the phenol process of treatment of the distillate; an increase in the viscosity index, and improvement in gravity, color, stability and a lowering of the sulphur compounds and carbon residue.

Operating and installation data will be found elsewhere.[9]

Furfural Process

After an extensive investigation in the field of selective solvents, the Texas Co. found that furfural fulfilled the requirements of a superior solvent as applied to a wide variety of stocks, its low cost and availability in large quantities, its stability in recovery operations, and its adaptability to countercurrent flow oper-

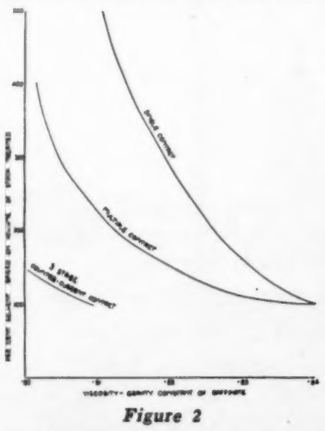


Figure 2

ations.[3] It is also adaptable to the production of high grade lubricating oils used in electric refrigerators, turbines, airplanes and transformers.

Furfuraldehyde (C_4H_3OCHO), the correct nomenclature of furfurol is obtained by distilling bran or carbonhydrates with dilute sulphuric acid. When freshly distilled and pure, it is colorless liquid with an empyreumatic smell, which boils at 323.6° F., but it soon darkens on standing. It possesses to a great extent the characteristics of an aromatic aldehyde.

The countercurrent process in this method of extraction is found to require a little less than half the amount of solvent used in the batch extraction method. Moreover, a much heavier gravity extract is obtained. The extractions are carried out at temperatures of 200 to 250° F. The two solutions obtained, namely, the extract and raffinate are found to contain 90 and 10 per cent of furfurol respectively. The solvent may be uncovered by vacuum distillation which permits operation at vapor temperatures of 210 to 230° F.

From the contact temperature it will be seen that it is possible to handle extremely viscous and waxy oils with sufficient contact between the distillate and solvent and allow very rapid settling.

Another advantage to be derived from the use of furfurol as a solvent is found in the fact that it possesses a very low taxicity, which is a very desirable feature from the standpoint of operation. According to Manley, McCarty and Gross[3]: "Experience in the manufacture and use of this solvent over a number of years has demonstrated that no ill effects whatsoever are encountered when the solvent is handled with reasonable care."

Finally, the further advantages to be derived from the furfurol process are: A

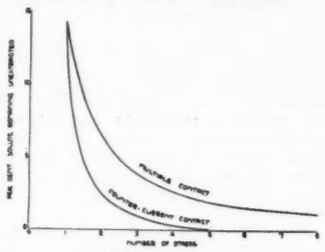


Figure 3

greater range of temperature application is possible, it is applicable to both distillate and residue oils from Mid-Continent, coastal, Pennsylvania and California crudes, and "by confirmatory mechanical tests furfurol-refined oils have been demonstrated to be well balanced high grade lubricating oils resisting oxidation, sludge formation, carbon deposition, and extreme viscosity-temperature variations. Cost of furfurol refining plant will average approximately $200 per 42-gallon barrel daily capacity. Cost of solvent refining operations, including fixed and overhead charges will approximate 51 cents per 42-gallon barrel of charged oil."

A description of plant installation and other pertinent data of operation of the furfurol process will be found in reference nine.

Chlorex Process

BB'Dichloroethyl ether, which is sold by Carbon & Carbide Chemical Corp. under the trade name of Chlorex, has been found to possess excellent qualities when used as a selective solvent in the manufacturing of lubricating oils.

Page, Buchler and Diggs have found that "aside from the desirability of high selectivity, it is apparent that this solvent is particularly well adapted to plant-scale usage."

The separation of the two phases when used as a solvent is rapid and efficient by virtue of its high specific gravity. The vaporization temperature of all grades of motor oils are well above the boiling point of Chlorex. Storage loss of the solvent is minimized with respect to other solvents by its low vapor tension. Its low viscosity is an added factor since the process may be carried out within the temperature range of 30 to 80° F. It is noninflowable at ordinary temperatures and its flashpoint is well above that considered hazardous for petroleum distillates. The toxicity of the solvent is quite low and this factor alone is considered quite excellent.

The Chlorex process is adaptable to any of the methods of extraction. The solvent is recovered from the distillate and raffinate by means of distillation and the loss of Chlorex in plant operation does not exceed —2 per cent per cycle.

Aside from improving the oxidation resistance and Conradson carbon number by Chlorex extraction, Page, Buchler and Diggs[10] claim that Chlorex more nearly approaches the ideal selective solvent. A detailed description of plant installation and operating costs will be found elsewhere in this Journal.[11]

Duo-Sol Process

Unlike the previous selective solvent processes, the Duo-Sol process employs two immiscible solvents for the manufacturing of lubricating oils, instead of employing only one single solvent. Moreover, the process is unique in that the two solvents employed are so chosen that one is selective for the naphthenic fractions, while the other is selective for the paraffinic oils.

The two solvents pass countercurrently to each other in the system while the change stock is allowed to enter at the center of the system. Thus, the stock will separate into two components, the paraffinic and naphthenic fractions, which will flow countercurrently to each other along with their respective solvents. As the flow process is continued, the naphthenic solvent will remove all traces of naphthenic constituents from the paraffinic fraction, and on the other hand, the paraffinic solvent will remove all traces of paraffinic constituents from the naphthenic fraction. Moreover, the process is analogous to that employed in the fractionating column. The difference being that the process is carried out in the liquid phase with the solvent power of the reagents used taking the place of the boiling range of the fractions. Thus, the process is developed around a principle already employed in refining procedure and not upon the particular selectiveness of any solvent. There are many solvents which are immiscible and selective to the paraffinic and naphthenic oils. Miller[12], recommends propane for the paraffinic oils, and a special blend of coal tar acids and bases with a boiling range of from 360 to 405° F.

The advantages and results of the process areas follow: "It eliminates en-

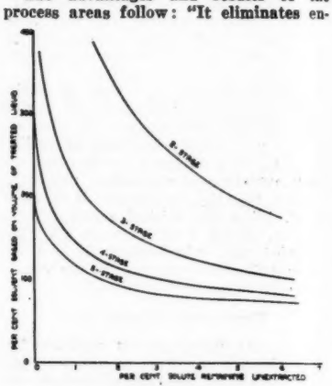


Figure 4

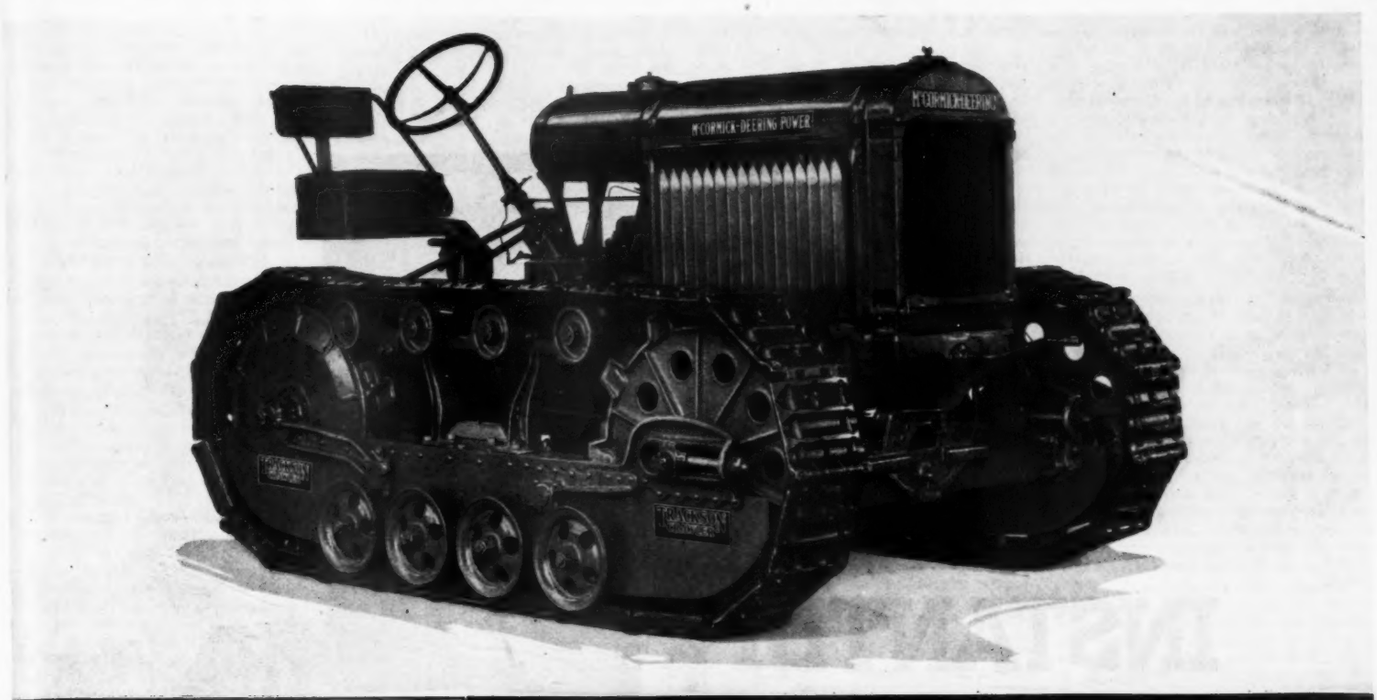
tirely the necessity for acid treatment. The paraffinic oil discharge ranges in color from 4 to 7 on the N.P.A. scale, depending upon the nature of the changing stock and may in any case be brought to final color by filtering."

Maximum yields of paraffinic oil from any given crude are obtainable by the process. The raffinate is very low in carbon residue, it is particularly resistant to sludging as a result of oxidation. The viscosity gravity constant is low, and the viscosity index is high. The cheapest refining stock available is adaptable to the process without previous refining steps. The grade of the yield is as great as is obtained by prevailing fractions employed for crudes characteristic of the Mid-Continent types. The reduction in the cost of production is accomplished in two ways, it reduces the cost of bringing the oil to final color and it does not decrease the value of the charging stock in either the paraffinic or naphthenic fractions.

Thus the available information on plant construction is that obtainable from a semicommercial pilot plant.[12]

Propane Process

Propane has been found to possess unusual qualities as a selective solvent in the extraction of asphaltic constituents of asphaltic or mixed-base residues, to dewax distillates or residual oils, and as a diluent in acid and clay treating sol-



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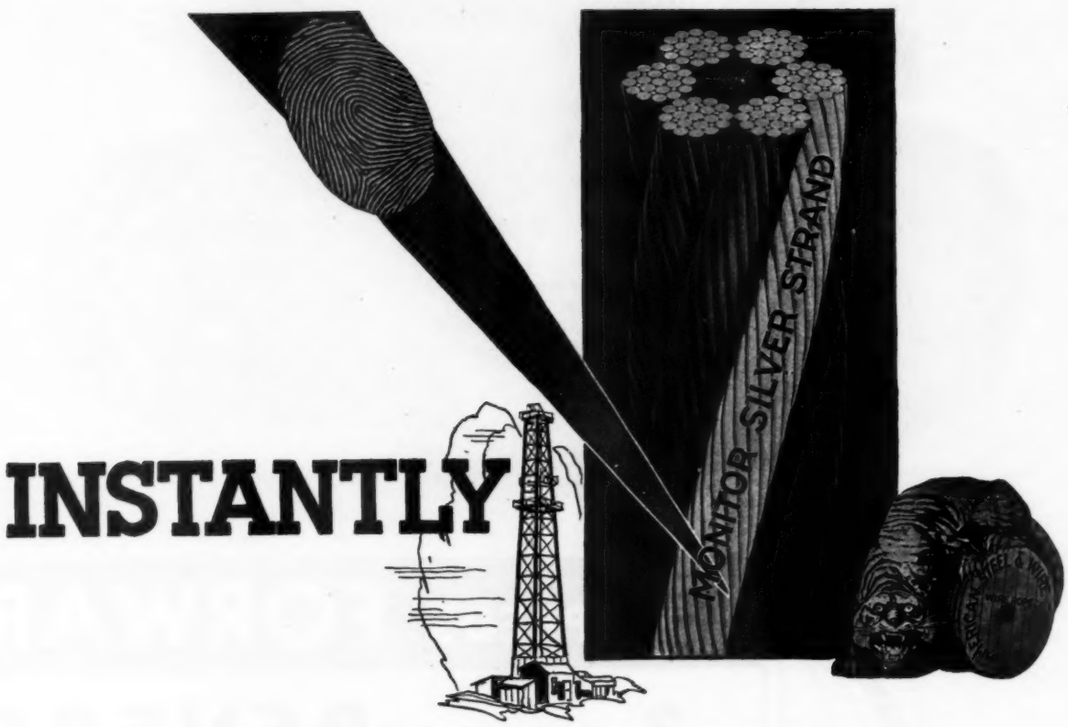

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vents. It has also been found to be quite adaptable to use in conjunction with other selective solvents.

By mixing a required amount of propane with the residuum at the proper temperature until equilibrium has been established and then allowing the mixture to separate by settling; two phases will be found. The propane phase will contain the desired lub oils. The asphaltic phase, which contains sufficient dissolved propane may be brought down of a heavy viscous liquid and may be transferred by pumping. The process thus lends itself to a method of continuous operation with relatively simple equipment.

Of the various elemental alaphatic hydrocarbons employed as asphaltic extraction agents, propane (C_3H_8) has been found to be the best solvent in separating the residuum into lub oil and asphalt of the usual characteristics.

Bray, Swift and Carr[16] have carried out extensive researches which determine the proper ratio of propane to residuum to give optimum extraction conditions.

By employing the refrigeration properties of propane, it may also be used as a dewaxing agent. This is accomplished by evaporating propane in the solution to be dewaxed. A precipitating medium is provided by applying liquid propane in excess of the amount required for refrigeration at the amount of wax removal. This diluent wax precipitation action of propane was found to be far more efficient than the efficiencies to be derived from naphthas or hydrocarbons of different boiling ranges. The dewaxing process is described by Bray, Swift and Carr.[16]

Propane has been found to increase the efficiency and solvent selectivity when used as a diluent in conjunction with other selective solvents. However, when used as a solvent itself its chief advantage lies in the fact that it is applicable to heavy residual and asphaltic oils, thereby eliminating the necessity of selecting crudes of low asphaltic content.

Acetone-Benzol Process

Like propane, acetone-benzol is used as a dewaxing agent and is applicable to any distillate in any location. The inventor of the process, Dr. F. X. Grovers, has stated that for a plant capacity of 1,200 bbls. wax distillate per day, the required amount of solvent is 2,000 bbls.

The literature on this process is somewhat limited at the present. According to Foster[14], it consists essentially in diluting the wax-bearing distillate with three to four volumes of a solvent mixture of about 35 per cent acetone and 65 per cent of 90 per cent benzol, chilling to the desired temperature, and filtering through a special press with rotating leaves.

The solvent and distillate are mixed in their proper proportions and agitated in a mix tank at a temperature of 70 to 90° F. The solution is then passed through the cooling equipment and then to a surge tank. Finally it is sent through the presses. The solution and press cake are sent to different storage and strippers at which place removal of the solvent takes place.

"The inventor points out that the pourpoint of oils dewaxed by the process is only slightly higher than the temperature of dewaxing; for example, to produce an oil of zero —5° F., the solution is filtered at only 3 to 5° F. lower than the desired pourpoint."

S-N Trichlorethylene Process

The S-N (Separator-Nobel Co.) process is another dewaxing process which employs trichlorethylene as the solvent medium. The process is similar to the naphtha centrifugal method of dewaxing with the exception that the centrifuge has a special bowl which permits the discharge of petrolatum from the center of the bowl and of the bright stock from the periphery. This is necessitated due to the fact that the specific gravity of 1.5 of trichlorethylene is much greater than that of the oil. With such a variation in specific gravity of oil and solvent, it is possible to operate the centrifuge at a much lower speed of 800 to 900 r.p.m. as against 15,000 to 17,000 r.p.m. in the naphtha centrifugal process.

In operation the trichlorethylene is preheated to about 120° F., mixed with the oil and allowed to cool to about the pourpoint of the mixture. Chilling is accomplished by the usual equipment, the solution entering at the top and discharged at the bottom. The capacity of this part of the equipment being such as to allow the chilling rate to be about 12° F. per hour. The mass is taken from the chiller directly to the S-N centrifuge which is completely encased. Exhaust steam which passes through enclosed coils in the apparatus is used to melt the petrolatum, thus eliminating the necessity of water-petrolatum settling tanks. Solvent reclamation is accomplished by distillation, the removal still operating integrally with the centrifugal equipment, thereby eliminating handling and evaporation losses. A plant design and operating costs are given by Pester.[15]

The advantages to be derived from the S-N process are as follows: The solvent does not decompose in darkness, and only in light when oxygen is present. It does not decompose by heating up to 266° F. However, it may decompose on heating in the presence of oxygen unless antioxidants are present. It does not hydrolize and the ordinary metals do not catalyze decomposition. Trichlorethylene is noncorrosive in the presence of antioxidant. The S-N centrifuge will give greater throughputs of dewaxed oil than the usual process. A volumetric reduction in capacity of the plant is accomplished by higher chilling rates, lower dilution of the trichlorethylene, and a smaller differential between the centrifuging temperature and the final pourpoint of the finished oil. The refrigeration required is also minimized with respect to the usual method. Fire hazards are reduced in consequence of the solvent being noninflammable. The solvent may be stored under water to prevent evaporation losses since it is not miscible with the latter.

Crotonaldehyde Process

The development of the Foster Wheeler process was started at the Massachusetts Institute of Technology and carried on later at the Foster Wheeler research laboratory. The solvents used in the process vary slightly in chemical characteristics but differ in volatility. The two solvents which have been most highly developed are crotonaldehyde and acrolein.

A flow chart of the process is presented by Poole and Wadsworth.[16] They found that the advantages to be derived by using crotonaldehyde as a selective solvent are, at maximum distillation temperature, 99.9 per cent of the solvent is recoverable. The minimum content temperature is apparently 60° F. and for many stocks the extraction may be carried out at 90° F. The solvent possesses no harmful toxic properties. The cost of the solvent is very low in comparison to other solvents, being only 75 cents per gallon. Under operating conditions the solvent is noncorrosive. The solvent is very stable when oxygen is excluded from the system. It dissolves in Pennsylvania neutral to about 16 per cent, and in Pennsylvania bright stocks about 10 to 15 per cent. At 68° F. it dissolves sparingly. Pennsylvania neutral and bright stocks. Poole and Wadsworth also state that crotonaldehyde possesses a greater affinity for naphthenic material than any other selective solvent that they have investigated.

The results effected by the Foster Wheeler process are: Increased viscosity index, as high as 20 per cent from Pennsylvania crudes. A considerable reduction in carbon residue is also affected. Filtration costs are considerably reduced and in the case of neutral stocks no acid or clay treatment is required to bring the raffinate to standard color specifications.

Nitrobenzene Process

The nitrobenzene process of solvent extraction has been developed by the Atlantic Refining Co.[17] Ferris and Houghton who report the findings of the development, estimate that the cost of processing by this method is 37 cents per barrel of charging stock, or, on the assumption that the total cost should be born by the raffinate, the estimated cost is 71 cents per barrel of raffinate produced. They also give a plant description and flow chart for the process.

Like other solvent processes it consists of mixing the distillate with a proper proportion of nitrobenzene at the desirable temperature to produce the optimum results. The process is adaptable to the countercurrent method either by the batch or continuous change treatment.

The inventors of the process have investigated a number of possible solvents and according to their report nitrobenzene was found to possess the best solvent properties and the method affords the manufacturing of such special lub oils as refrigerator oils, transformer oils, compressor oils, and oils of a naphthenic character which are manufactured from the solvent layer which is injected in the preparation of the paraffinic lubs. The raffinate products are of a high grade character comparable with Pennsylvania quality with a viscosity-gravity content of 0.815.

Crude stocks suitable for the nitrobenzene treatment are limited only to those which have enough paraffinic constituents to produce a raffinate and in which the boiling range is sufficiently high to permit recovery of the solvent. The loss of which, in the process is about .2 per cent per cycle. Color of the paraffinic oils is less affected by this solvent, and while the investigations claim that the process eliminates the necessity of any acid or clay treatment, such treatment added to the raffinate produces a quality of high stability. Nitrobenzene does not dissolve the wax constituents and, therefore the raffinate must be dewaxed.

The plant hazards which may be encountered in the process are two in number, first, the toxicity to the employes and second, the combustion hazard nitrobenzene has an open cup flash of 210° F. A hermetic system is thus required in the process.

While it is claimed that in some cases of the foregoing processes, the solvent and methods are superior to others, a striking analogy exists at present between the present status of selective solvent processes and the administration's development of various combinations of the alphabet such as NRA, PWA, CWA, etc. It remains to be seen which will produce the best results, give the greatest recovery and live the longest.

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Refiners of Pennsylvania Grade Crude Made Major Improvements Past Year

By T. O. GRISELL

Executive Secretary, Pennsylvania Grade Crude Oil Association

More than $1,000,000 were invested in pipe still additions to refineries in the Pennsylvania grade region in the last year. Three new cracking units have been put into operation. Lub plants all the way from Bolivar to Cabin Creek have been modernized. Particular emphasis has been placed on laboratory control equipment and on additions to well-trained technical staffs.

The crude distillation units, which were either built during the past 12 months or now are in course of construction, were installed by the Canfield Oil Co. at Coraopolis; the Daugherty refinery of L. Sonneborn Sons, Inc., at Petrolia; Ultra-Penn Refining Co., at Bruin; the Pennsylvania Refining Co. and the Oil Creek Refining Co. at Titusville; the United Refining Co. and Sloan & Zook, Inc., at Warren; the Bradford-Penn Refining Co. at Clarendon; the Wolverine-Empire Refining Co. at Reno, and the new Allegany Refiners, Inc., at Bolivar, N. Y.

A variety of associated installations also were made at these points in addition to the primary towers, probably bringing the total cost of these new plant investments up to $1,250,000.

The gasoline problem has presented rather serious difficulties to the refiners of the Pennsylvania region since the famous octane race got under way. By the installation of cracking equipment, together with the use of tetraethyl lead in specified quantities, the quality of Pennsylvania motor fuel can be and has been brought up to the most rigid requirements. It has been pointed out that the rugged character of the western Pennsylvania landscape, together with the sudden climatic changes characteristic of the region, makes it necessary that high quality fuel be furnished to the markets contiguous to these plants. However, there still is a substantial storage of straightrun gasoline and refiners who have a special interest in the problems are co-operating actively to reach a satisfactory solution.

The new cracking or reforming towers have been installed by the Quaker State Oil Refining Corp. at Farmers Valley, Pa., and by the Pennzoil Co. at Rouseville. The Kendall Refining Co. at Bradford has added a new furnace to its cracking setup.

As is well known, the movement initiated last year to seal premium lubricants in 1 and 5-quart cans and in specially designed drums had its beginning in the Pennsylvania region. The pioneers were Canfield and Kendall. Now practically every refiner in the territory has installed canning equipment.

Rule of thumb refinery practice has long since disappeared from this region.

(Continued on Page 115)

Petroleum Refiners Division
OF THE
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The Petroleum Refiners Division of the National Association of Credit Men was organized Jan. 1, 1926. It is composed of leading oil marketing companies throughout the United States. The Principle aims of this Division are:

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2. Mutual protection of accounts receivable through the exchange of information via a Credit Interchange Bureau.

3. Concerted effort in developing good business practice and sound merchandising policies for the customers of members.

4. The promotion of nationwide co-operation amongst credit departments of oil companies.

5. And, by the means described above, members contribute to the financial stability of the concerns they represent.

Headquarters of the Petroleum Refiners Division of the National Association of Credit Men are at 910 Daniel Building, Tulsa.

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Polymerization Is a Function of Sulphuric Acid Concentration, Temperature and Quantity

By JACQUE C. MORRELL and GUSTAV EGLOFF
Universal Oil Products Co.

Despite the large amount of research that has been carried on for years to find other methods, sulphuric acid treatment is still dominant in the refining of cracked distillates.

This report relates to the treatment of cracked gasolines with sulphuric acid and its effect upon the polymerization and solution losses, desulphurization, octane rating, gum and color. In general, petroleum distillates are refined by chemical and physico-chemical methods. In the refining of cracked distillates by chemical methods, many reagents besides sulphuric acid have been proposed including other acids and heavy metal salts. As examples of the physico-chemical methods of treatment may be mentioned the use of adsorbents which include the various earths such as fuller's earth, bentonite and bauxite. The hydrocarbons are treated by the adsorbent earths in liquid or vapor phase.

TABLE 1—TREATMENT OF FRACTIONS OF CALIFORNIA CRACKED DISTILLATE

Per cent fraction—	Distillation cut—Temp., deg. F.—Initial	Final	Per cent sulphur in—Untreated distillate	Treated distillate	Per cent desulphurization	Color
0-20	77	190	0.45	0.05	89	Water white
20-40	190	280	0.81	0.58	28.4	Light yellow
40-60	280	350	0.95	0.75	21	Yellow
60-80	350	418	0.90	0.75	16.7	Dark yellow
80-100	418	...	0.84	0.51	39.3	Dark red

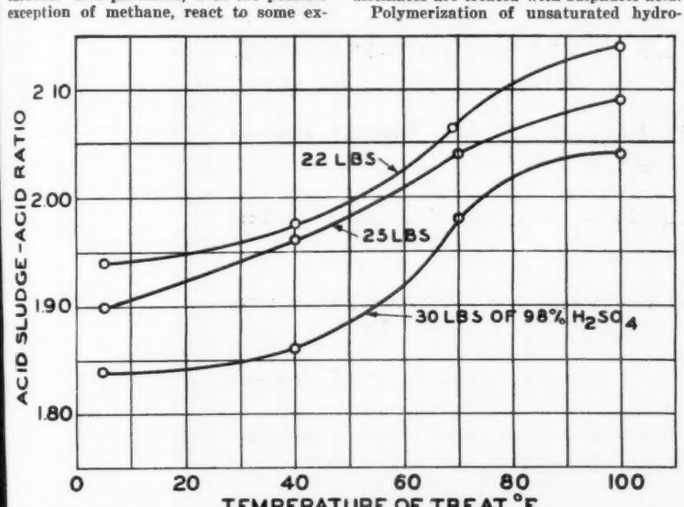
TABLE 2—THE BREAK-UP OF UNTREATED CALIFORNIA CRACKED DISTILLATE

Per cent fraction—	Temp., deg. F.—Initial	Final	Sulphur, per cent	Color
0-10	84	153	0.40	Water white
10-20	153	215	0.59	Water white
20-30	215	230	0.76	Slightly yellow
30-40	230	277	0.96	Reddish yellow
40-50	277	308	1.09	Reddish yellow
50-60	308	335	1.16	Greenish yellow
60-70	339	381	1.13	Greenish yellow
70-80	381	410	0.99	Deep yellow
80-90	410	450	0.89	Reddish yellow

Total loss = 5 per cent.

Chemistry of Refining

It may be stated briefly that cracked distillates contain the four major groups of hydrocarbons—namely, unsaturated, aromatic, naphthene and paraffin hydrocarbons. The paraffins, with the possible exception of methane, react to some extent with sulphuric acid containing high percentages of sulphur trioxide, the reaction being more pronounced with increasing temperatures. The lower members of the naphthene series react with concentrated sulphuric acid, the reactivity decreasing with increasing molecular weight. Aromatic hydrocarbons dissolve to a considerable extent in sulphuric acid, particularly in concentrations above 80 per cent, the solubility increasing as the concentration of the acid increases. The unsaturated or olefin hydrocarbons are the most reactive group.

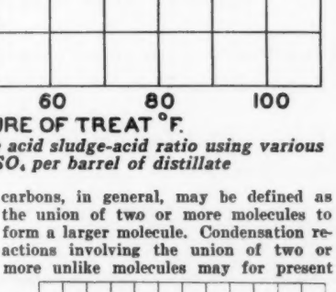


Graph 1—Effect of temperature on the acid sludge-acid ratio using various quantities of 98 per cent H_2SO_4 per barrel of distillate

Unsaturated Hydrocarbons

It is generally known that sulphuric acid reacts with olefins to give four types of products, namely, esters, alcohols, polymers and oxidation products. The extent to which each of these reactions occurs is a function not only of the molecular weight, but also of the structure of the olefins and the concentration of the acid. Polymerization increases with the concentration of acid to a maximum with 91 per cent acid. Tertiary alcohols are formed directly by treatment with sulphuric acid and originate from tertiary olefins, which have been shown to be the most reactive. Condensation of olefins with aromatic hydrocarbons has been reported and reduction of olefins by sulphuric acid treatment has been indicated by several workers. There is also some evidence that aromatic hydrocarbons may condense with paraffins when cracked distillates are treated with sulphuric acid.

Polymerization of unsaturated hydrocarbons, in general, may be defined as the union of two or more molecules to form a larger molecule. Condensation reactions involving the union of two or more unlike molecules may for present purposes also be included under the general term "polymerization."



Graph 2—Effect of acid concentration on the acid sludge-acid ratio (25 lbs. equivalent of 98% H_2SO_4 per barrel at 70°F.)

In the sulphuric acid treatment of cracked distillates the losses may be divided into two components, namely, the solution and the polymerization losses. The solution loss is the volume or percentage of distillate which is removed by reaction with the acid and solution in the sludge. The polymerization loss refers to the portion of the gasoline which is converted into higher boiling hydrocarbon fractions.

The polymerization loss may be calculated by the following formula:

$$\frac{A[B-(C+D)]}{B}$$

A equals 100 minus the per cent solution loss.

B equals per cent at some chosen vapor temperature (400° F.) in untreated cracked distillate.

C equals per cent at some chosen vapor temperature (400° F.) in treated cracked distillate.

D equals per cent distillation loss on distilling treated cracked distillate.

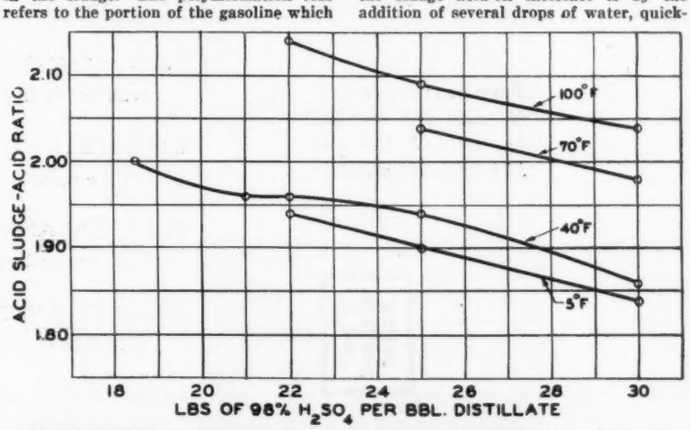
The formula gives the polymerization loss in terms of gasoline content in the untreated cracked distillate and not in terms of the treated cracked distillate. These two values are equal when the original distillate is an endpoint gasoline.

Acid Sludge-Acid Ratio

The acid sludge-acid ratio, i.e., the ratio of the volume of acid sludge formed to the volume of acid employed for treatment of a cracked distillate, is an index of the reaction which occurs. It is sometimes the practice to determine the solution losses resulting from treatment of cracked distillates with sulphuric acid by making use of the difference in volume between the acid sludge obtained and the acid used. This procedure is subject to criticism because of changes in volume due to reactions. The reactive constituents removed when treating with sulphuric acid are most likely diolefins, and the more reactive mono-olefins, for example those of the tertiary types, although secondary olefins and aromatic hydrocarbons may also be involved. The solution loss should be proportional to the quantity of reactive substances present, the quantity and concentration of acid used, and the temperature at which the reactions occurs.

A series of tests were made with California cracked distillate to determine the acid sludge-acid ratio. The data together with the accompanying graphs show the effect of acid concentration, temperature and varying amounts of 98 per cent sulphuric acid on the acid sludge-acid ratio.

The acid sludge was measured after the reaction vessel had been allowed to drain for one hour and the sludge allowed to stand overnight for separation of the oil and sludge. One method of determining the sludge acid-oil interface is by the addition of several drops of water, quickly noting the point of separation. Excepting where the sludge is very fluid, a dark ring may also be formed at the oil sludge interface.



Graph 3—Effect of temperature and amount of acid on the acid sludge-acid ratio when treating a California distillate

It was found that the acid sludge-acid ratio varied both with the temperature and concentration of acid as is indicated in the following graphs Nos. 1 and 2:

Graph 1 showing these points is nearly a straight line with a differential of 0.002 in ratio per degree F. The curves for 22 and 30 pounds of acid show a moderate curvature, and all indicate a tendency to flatten out at the higher temperature.

Graph 3 shows these points as straight lines of practically equal slopes. The differential is 0.013 in ratio per pound of acid per barrel. A few results with 93 per cent acid indicate that straight lines of about the same slope are also obtained with this acid, but the values are 0.2 lower than they are for 98 per cent acid.

Distribution of Sulphur in Cracked Distillates

The distribution of sulphur in cracked distillates is of general interest as well as in connection with the development of treating methods to desulphurize the distillates. In many cases the percentage of sulphur plotted against boiling points rises to a maximum and then drops. This is illustrated by Graph 4 showing the sulphur content of a cracked distillate from heavy California fuel oil plotted against per cent distilled off.

A 10-pound sulphuric acid treat per

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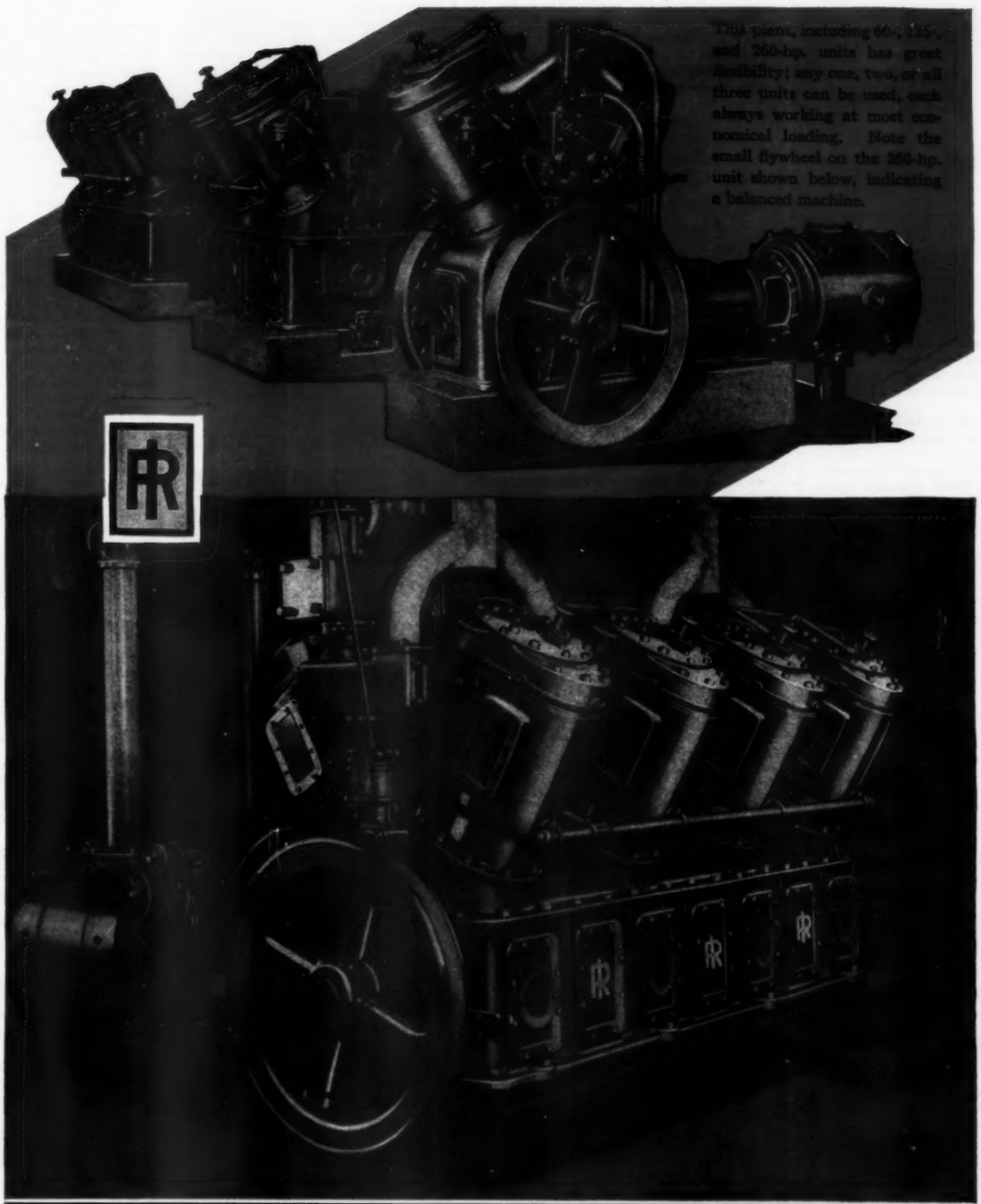

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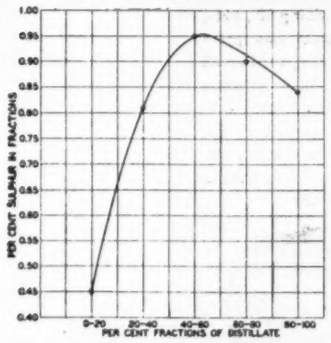
barrel of distillate was made on each of the 20 per cent fractions and a comparison of the sulphur before and after treatment is shown in Table 1 These data indicate strikingly the differences in reactivity with sulphuric acid of types of sulphur compounds present in the various fractions.

In Graph 5 the 100 cc. Engler distillation curve of another California cracked

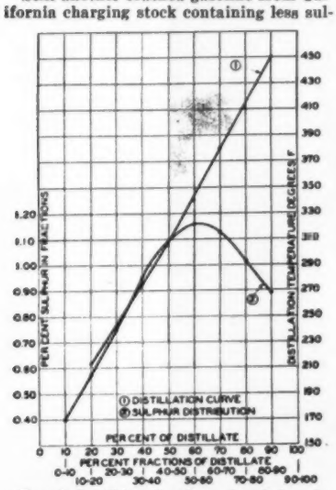


Graph 4—Distribution of sulphur in cracked distillate from heavy California oil (per cent sulphur in untreated cracked distillate=0.88)

distillate is also shown, plotting temperature against the per cent distilled off. The maximum sulphur content of 1.16 is in the 50-60 per cent fraction. The sulphur content of the 80-90 per cent fraction falls off to 0.89, which is less than the sulphur content of the 30-40 per cent fraction.

The data in Table 2 show the break-up of the untreated cracked distillate from the heavy California oil by Hempel distillation and the sulphur content and color of the individual fractions.

Still another cracked gasoline from California charging stock containing less sul-


① DISTILLATION CURVE
② SULPHUR DISTRIBUTION
PER CENT OF DISTILLATE
PER CENT FRACTIONS OF DISTILLATE
PER CENT SULPHUR IN FRACTIONS
DISTILLATION TEMPERATURE DEGREES F

Graph 5—Distribution of sulphur in cracked distillate from heavy California oil. (Per cent sulphur in untreated cracked distillate=0.95)

phur than those previously discussed was analyzed and the same typical maximum was observed. This is illustrated by Graph 6.

Graph 7 shows the distribution of sulphur in low endpoint cracked gasolines of California and Venezuelan origin.

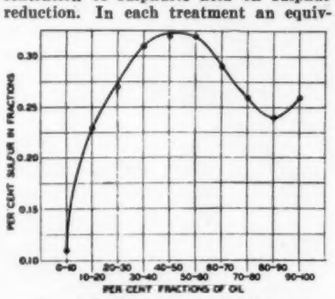
Desulphurization of Cracked Distillates

The evidence to date shows that elementary sulphur and sulphur compounds such as hydrogen sulphide, mercaptans, sulphides and disulphides may be readily removed with sulphuric acid, while compounds of the thiophene type are much more difficult to remove under the ordinary conditions of refining.

The reactions of sulphuric acid with sulphur compounds are principally oxidation and solution. For example, hydrogen sulphide may be oxidized in successive steps to sulphur and sulphur dioxide. Mercaptans are oxidized to the disulphides and perhaps higher oxidation products. Alkyl sulphides and the dialkyl sulphides are quite soluble in sulphuric acid. Oxidation products of the sulphides such as sulphoxides and sulphones also dissolve in sulphuric acid. Thiophene and its derivatives either form the sulphonic acids or are simply dissolved.

Desulphurization of cracked distillates is one of the most difficult problems in petroleum refining and despite the enormous amount of research carried on in the past a great deal of effort is still being directed to the most economic solution of this problem.

Graph 8 shows the effect of the concentration of sulphuric acid on sulphur reduction. In each treatment an equiv-

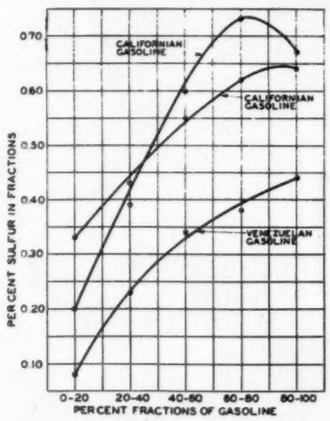


Graph 6—Sulphur in California cracked gasoline

alent amount of sulphuric acid of the concentration indicated was used. From the graph it may be seen that the effect of concentration on desulphurization is quite marked. For example, 95 per cent sulphuric acid reduced the sulphur content of the California distillate from 0.83 to 0.35, whereas an equivalent amount of 60 per cent acid reduced the sulphur content to only 0.74. The degree of desulphurization falls off rapidly with decreasing concentrations of acid.

Table 3 and the accompanying Graph 9 show the degre of desulphurization when treating a California cracked gasoline with amounts of sulphuric acid, from 1.5 to 30 pounds per barrel, the treatment being carried out at room temperature. The results show clearly that for this particular type of distillate the desulphurization is almost directly proportional to the amount of 93 per cent sulphuric acid used, all other factors remaining constant. Table 3 also shows the solution loss, polymer formation, sulphur content and octane number of the cracked gasoline as a function of treatment with varying amounts of acid. The solution loss and polymer loss increase with increasing amount of acid, whereas the sulphur content and octane number decrease with increasing amount of acid.

The degree of desulphurization is likewise dependent upon the type of treatment; for example, different results will be obtained depending upon the particular combination of acid and caustic or plumbite employed in the treatment. The results in Table 3-A show a comparison when a cracked distillate from Mexican oil is (1) acid treated followed by water



Graph 7—Sulphur distribution in 410° F.E.P. untreated gasolines

TABLE 3—CALIFORNIA CRACKED GASOLINE

Treatment—Acid, lbs./bbl.	Untr.	1.5	5	10	15	20	25	30
Solution loss	...	0.30	1.0	2.3	3.4	4.4	5.8	6.7
Polymers	...	0.50	1.0	1.0	2.3	3.2	4.1	4.7
Gravity, deg. A.P.I.	50.3	52.5	52.6	52.4	52.3	52.3	52.1	52.2
Color, deg. Saybolt	Red	Yellow	17	19	22	22	21	20
Color stability*	...	...	16	18	21	21	21	20
Gum, mgs./100 cc., copper dish	472	232	38	13	6	6	8	7
Sulphur, per cent	0.61	0.55	0.48	0.41	0.38	0.35	0.91	0.14
Octane number	76	74	72.5	72.5	72.0	72.0	71.5	69.5
Oxygen bomb stability—induction period—minutes without inhibitor	600	220	555	...	...	...	...	...

*Equivalent to two hours noon June sunlight.

TABLE 3-A—TREATMENT OF MEXICAN CRACKED DISTILLATE

	(1) Acid-caustic	(2) Split caustic	(3) Split plumbite
Treatment—Acid, lbs./bbl.	12	12	12
Concentration, per cent	93	93	93
Temperature of treatment, deg. F.	40	40	40
Solution loss, per cent	3.8	3.3	3.8
Polymerization loss, per cent	1.4	1.4	2.1
Distillation loss, per cent	3.0	3.1	3.0
Total loss, per cent	8.2	7.8	8.9
Gravity, deg. A.P.I.	58.2	58.5	58.6
Color, deg. Saybolt	27	29	29
Color (lamp stability)*	19	24	25
Sulphur, per cent	0.21	0.14	0.15

*Equivalent to two hours noon June sunlight.

TABLE 4—CALIFORNIA CRACKED GASOLINES

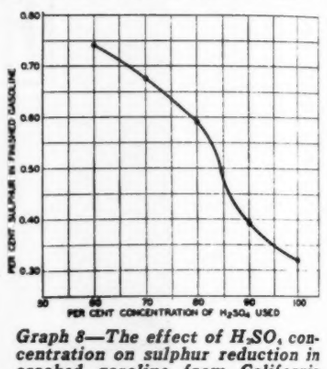
	Untreated	Acid treated		—30% overhead— untreated acid treatment of bottoms	
Gasoline A					
Acid, lbs./bbl. bottoms	...	...		4	6
Acid, lbs./bbl. raw gasoline	None	6		3.8	4.2
Sulphur in overhead, fraction per cent	0.19	...		...	...
Gravity, deg. A.P.I.	57.2	56.4		57.7	57.6
Color, deg. Saybolt	...	20		20	25
Color stability*	...	19		18	22
Gum, mg./100 cc. copper dish	...	22		43	17
Sulphur, per cent in total blend	0.32	0.22		0.26	0.19
Gasoline B					
Acid, lbs./bbl. bottoms	...	...	...	3	16
Acid, lbs./bbl. raw gasoline	None	8	16	5.6	11.2
Sulphur in overhead, fraction per cent	0.19	...	...	...	...
Gravity, deg. A.P.I.	55.1	56.1	56.1	56.4	56.6
Color, deg. Saybolt	...	27	30+	30+	27
Color stability*	...	24	29	27	27
Gum, mg./100 cc. copper dish	...	25	60	169	178
Sulphur, per cent in total blend	0.62	0.43	0.35	0.40	0.24
Gasoline C					
Acid, lbs./bbl. bottoms	...	...	...	10	20
Acid, lbs./bbl. raw gasoline	None	10	20	7.0	14.0
Sulphur in overhead, fraction per cent	0.36	...	...	...	...
Gravity, deg. A.P.I.	49.8	51.4	50.8	51.5	51.5
Color, deg. Saybolt	...	30+	27	30	28
Color stability*	...	30+	24	27	27
Gum, mg./100 cc. copper dish	...	29	6	34	6
Sulphur, per cent in total blend	0.67	0.36	0.22	0.35	0.38

*Equivalent to two hours noon June sunlight.

wash after removal of the acid sludge and neutralization with caustic solution before rerunning; (2) split caustic, and (3) split plumbite treatments, that is, treating with caustic or plumbite (solution of litharge dissolved in caustic soda) before and after the acid treatment. The same amounts of reagents are used whether the refining is carried out in the normal manner or by the "split" method. It is quite definitely shown that a greater degree of desulphurization is effected by treatment of the cracked distillate with caustic or plumbite prior to the acid treatment.

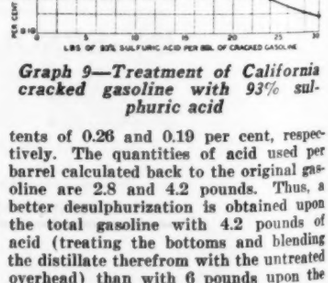
Another principle which has shown improved results with economy in the use of acid has been the removal of a relatively light overhead fraction requiring no treatment, with acid treatment of the bottoms or side cut from a fractionating column and combining the distillate from the acid treated material with the untreated fraction. The results on California cracked gasoline are shown in Table 4.

Each of the gasolines was treated by agitating them with from 6 to 20 pounds of acid per barrel and distilling with fire and steam at a maximum temperature of 350° F. The results show that improved desulphurization is obtained for each of the three cracked distillates by the removal of approximately 30 per cent untreated fraction and acid treatment of only the heavier (70 per cent) fraction or bottoms. The gasoline from Sample A, with an original sulphur content of



Graph 8—The effect of H_2SO_4 concentration on sulphur reduction in cracked gasoline from California oil. In each case the amount of treating acid is so chosen that there is present 1.4% of H_2SO_4 (as actual H_2SO_4) by volume (2.96% by weight)

0.32 per cent, showed a reduction to 0.22 when treated with 6 pounds of 23 per cent sulphuric acid. The 30 per cent overhead fraction contained 0.19 per cent sulphur. Acid treatment of the bottoms with 4 and 6 pounds of acid, respectively, and redistillation of the acid treated product with subsequent blending of the overhead untreated distillate and the distillate from the treated bottoms showed sulphur con-



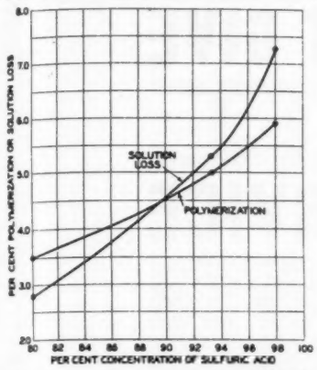
Graph 9—Treatment of California cracked gasoline with 93% sulphuric acid

tents of 0.26 and 0.19 per cent, respectively. The quantities of acid used per barrel calculated back to the original gasoline are 2.8 and 4.2 pounds. Thus, a better desulphurization is obtained upon the total gasoline with 4.2 pounds of acid (treating the bottoms and blending the distillate therefrom with the untreated overhead) than with 6 pounds upon the original gasoline, and the color and color stability are also improved. Similar results are shown with the other two gasolines B and C. For example, in the case of gasoline B equivalent desulphurization

was obtained with 11.2 pounds of acid per barrel by treating the bottoms and blending the distillate therefrom with the 30 per cent untreated overhead as by the treatment of the total gasoline with 16 pounds of acid. In the case of C, however, the sulphur content of the untreated overhead fraction is 0.35 per cent, so that no saving in acid may be shown when the sulphur content of the final blend is brought to a point below this value.

Polymerization and Solution Losses

Concentration of acid has a marked effect on solution and polymerization. This is shown in Table 5 on a California and



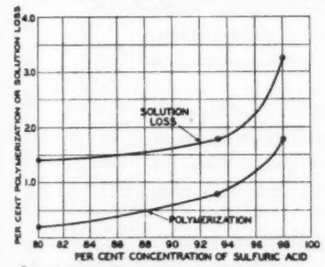
Graph 10—Treatment of California cracked distillate with 25 lbs. per bbl. of H_2SO_4 at 70° F.

Venezuela cracked distillate. Graphs 10 and 11 are plotted from these data.

It may be observed from the results in Table 5 that, at constant temperature, increase in concentration of acid for both the California and Venezuela cracked distillates showed a marked increase in the solution loss, a definite increase in polymers—but not so marked as the solution loss—and increased desulphurization.

The effect of temperature on solution loss, polymerization, and per cent sulphur in finished gasoline on two California cracked distillates is summarized in Tables 6 and 7. Various amounts of 93 and 98 per cent sulphuric acid were employed in these experiments.

The data in Tables 6 and 7 show that, maintaining the amount and concentration of acid constant, reduction in temperature decreases the polymers very markedly, whereas the solution loss changes only slightly. With both types



Graph 11—Treatment of Venezuelan cracked distillate with 10 lbs. per bbl. of H_2SO_4 at 70° F.

of California cracked distillates employed in these experiments, the sulphur content of the treated oil showed very little change at temperatures of treatment of 100°, 70°, 40° and 0° F., using either 93 or 98 per cent sulphuric acid. At 100°, 70° and 40° F., the 93 per cent acid is only approximately two-thirds as efficient in desulphurization as the 98 per cent acid for the same amount of solution loss and polymerization.

From the results as shown in Graphs 12, 13 and 14, it may be concluded that the polymerization is apparently a function of temperature and the lower the temperature the less the polymerization. It may be seen also in the case of the California distillates that polymerization is more than doubled when the temperature is raised from 0° F. to 40° F., or approximately doubled from 40° F. to 100° F.

TABLE 5—TREATMENT OF CALIFORNIA AND VENEZUELA CRACKED DISTILLATE AT 70° F.

Type of cracked distillate—	Acid conc. per cent	Lbs./bbl.	Per cent solution loss	Per cent polymers	Per cent sulphur in finished gasoline
California A	80.00	25	2.8	3.5	0.32
(0.57% S., 92.7% 410° F.E.P.)	93.24	25	5.3	5.0	0.16
	98.00	25	7.3	5.9	0.12
Venezuela A	80.00	10	1.4	0.2	0.23
(0.43% S., 91.6% 410° F.E.P.)	93.24	10	1.8	0.8	0.17
	98.00	10	3.3	1.4	0.10

TABLE 6—TREATMENT OF CALIFORNIA CRACKED DISTILLATE AT VARYING TEMPERATURES
Gasoline B

Acid conc., per cent—	Lbs./bbl.	Temp., deg. F.	Solution loss	Polymers	Per cent sulphur in finished gasoline
93.24	30	100	7.2	6.3	0.15
93.24	30	70	5.6	5.3	0.14
93.24	30	40	5.4	3.0	0.15
98	22	100	6.3	6.3	0.14
98	22	70	5.4	5.2	0.14
98	22	40	5.4	3.3	0.14
98	22	0	5.9	1.6	0.12

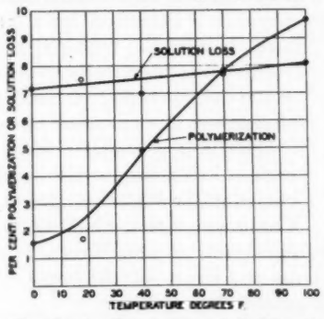
TABLE 7—TREATMENT OF CALIFORNIA CRACKED DISTILLATE AT VARYING TEMPERAURES
Gasoline C

Acid conc., per cent—	Lbs./bbl.	Temp., deg. F.	Solution loss	Polymers	Per cent sulphur in finished gasoline
98	30	100	8.4	10.2	0.11
98	30	70	7.7	9.4	0.09
98	30	40	7.1	4.0	0.10
98	30	0	6.3	2.7	0.10

TABLE 8—TREATMENT OF CRACKED DISTILLATES AT VARYING TEMPERATURES

Cracked distillate treated—	Pounds 93.2% sulphuric acid per bbl.	Temperature of treat, deg. F.	Per cent oil recovered	Per cent 437° F.E.P. gasoline in distillate Raw	Treated	Treating losses of gasoline based on gasoline Per cent solution	Per cent polymers	Per cent sulphur in distillate Untreated	Treated 437° F.E.P.
Smackover	10	70	95.4	77.9	76.7	2.4	0.5	0.5	0.15
	10	18	96.3	77.9	77.2	2.2	0.2	0.5	0.17
	10	0	96.2	77.9	77.9	2.2	0.5	0.5	0.18
West Texas	12	70	97.7	77.0	73.8	2.1	2.7	0.69	0.09
(Winkler County)	12	18	96.5	77.0	76.2	1.8	0.5	0.69	0.12
	12	0	96.0	77.0	76.7	2.4	0.3	0.69	0.12
Venezuela B	12	70	95.0	70.9	69.0	3.4	0.9	0.87	0.14
	12	18	96.0	70.9	70.5	2.2	—0.2	0.87	0.20
	12	0	95.8	70.9	71.0	3.1	—0.9	0.87	0.21

With one type of California distillate (D) the sulphur content was very greatly reduced with decreasing temperatures, while for the other Californian type the differences are within experimental error.

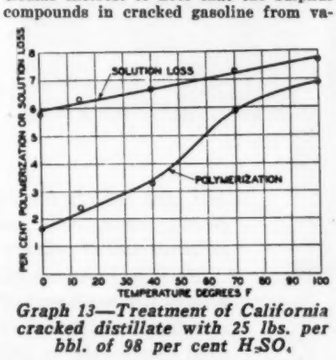


Graph 12—Treatment of California cracked distillate with 30 lbs. per bbl. of 98 per cent H_2SO_4

The Venezuela oil actually showed an increase in sulphur content when the temperature was lowered from 40° to 0° F.

Table 8 shows a comparison of the treatments with 93.2 per cent sulphuric acid of cracked distillates from Smackover, West Texas and Venezuela cracking stocks. Apparently, for the smaller amounts of sulphuric acid (less than 12 pounds per barrel of distillate) the lower temperatures are not as effective in reducing polymerization losses as the larger amounts which are usually necessary for effective desulphurization. However, even with 12 pounds of acid, reduction in temperature was quite effective in reducing polymerization with the West Texas cracked gasoline.

In connection with Table 8, it is of particular interest to note that the sulphur compounds in cracked gasoline from va-



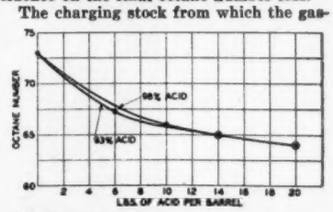
Graph 13—Treatment of California cracked distillate with 25 lbs. per bbl. of 98 per cent H_2SO_4

rious sources respond quite differently in respect to their removal by sulphuric acid treatment.

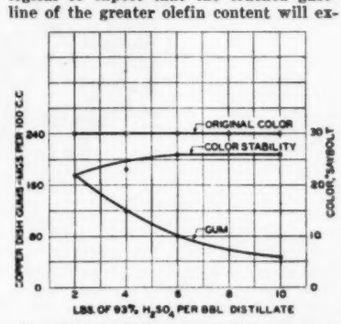
The Effect of Sulphuric Acid Treatment on Octane Rating

In general, treatment with concentrated sulphuric acid reduces the octane rating of cracked gasolines. This reduction will depend on several factors, namely, (1) the charging stock source of the gasoline, (2) the quantity of acid employed, (3) the concentration of the acid, (4) the octane number of the untreated gasoline, and (5) the degree of cracking or the percentage of olefins and aromatics present in the gasoline. To determine the effect on each of these factors would be exceedingly difficult, as two or more of them are usually existent at the same time and inseparable. However, each of them may be discussed indicating its influence on the final octane number loss.

The charging stock from which the gasoline is processed has an important relationship to the octane number obtainable in a cracked gasoline under a given set of cracking conditions and to the octane number loss experienced with identical sulphuric acid treatment. In general, the more naphthenic or aromatic the charging stock may be, the lower will be the octane loss during the treatment of the cracked gasoline. Thus, California cracked gasolines may be expected to show a comparatively small loss in antiknock properties. Similarly, Smackover and Black Bayou cracked gasolines will not show as great a loss as other more typical Mid-Continent stocks. This is illustrated in Table 9, in which several gasolines of different charging stock source have been treated with 6 or more pounds per barrel of sulphuric acid. The typical Mid-Continent cracked gasolines of the first two columns show the greatest losses of octane number per unit quantity of acid. However, the data as presented in Table 9 does not eliminate several additional factors which without doubt influence the loss in octane number upon acid treatment. The olefinic contents of these gasolines probably show considerable variation. In addition, the octane numbers of the untreated gasolines are at slightly different levels from each other. It is quite logical to expect that the cracked gasoline of the greater olefin content will ex-



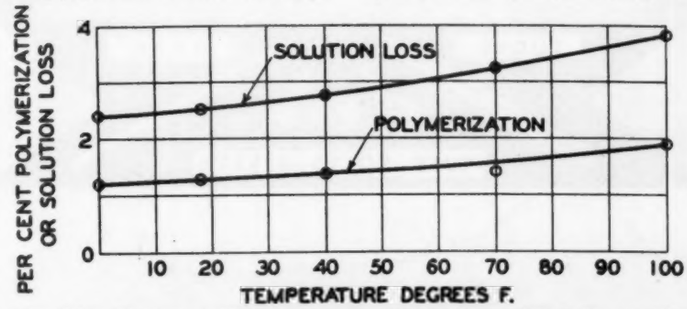
Graph 15—Treatment of Oregon Basin (Wyoming) cracked gasoline with sulphuric acid effect on octane number



Graph 16—Effect of various quantities of acid when treating a Mid-Continent cracked distillate

perience the greater loss of gasoline and octane number upon sulphuric acid treatment. The major differences probably exist in the octane losses between gasolines of different original octane numbers due to variations in olefin contents. However, if an increase in the aromatic hydrocarbon content has occurred, a lower loss may result.

The influence of the quantity of sulphuric acid employed in the treatment is obvious. With an increase in acid the losses of octane number increase. The extent of these losses, as may be expected from the discussion above, shows considerable variation between gasolines. With a variation in the concentration of sulphuric acid, there results a difference in the extent of octane loss in the same gasoline. The lower concentrations of sulphuric acid, below 75 per cent, show little



Graph 14—Treatment of Venezuelan cracked distillate with 10 lbs. per bbl. of 98 per cent H_2SO_4

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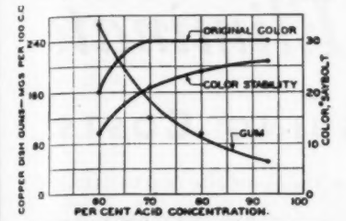
or no treating effect and therefore do not influence the original antiknock properties of the gasoline. The higher concentrations show an increasingly greater loss.

Table 10 and Graph 15 show the effect of varying amounts of 93 per cent sulphuric acid on the octane rating of cracked gasoline from Oregon Basin crude (Wyoming). Corresponding solution loss, polymerization and reduction in sulphur are also shown in the table.

Table 11 and Graph 15 show the effect of 98 per cent sulphuric acid employed



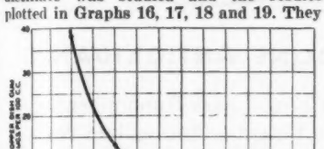
Graph 17—Effect of acid concentration on gum. Color and stability. Mid-Continent cracked distillate treated with equivalents of 10 lbs. of 93 per cent H_2SO_4 per bbl.

in amounts varying from 10 to 20 pounds per barrel on cracked distillate from Oregon Basin crude oil.

In connection with Table 10, loss of approximately six octane numbers occurs when treating with 6 pounds of sulphuric acid per barrel, whereas, when this quantity of acid is more than doubled, the octane drop is only eight numbers. Practically the same conclusion may be drawn from Table 11. Also within the limits of the experiments, 98 per cent sulphuric acid gave approximately the same results as 93 per cent acid.

Effect of Sulphuric Acid Treatment on Color and Gum

The effect of various quantities of acid on the color and copper dish gum of a Mid-Continent and California cracked distillate was studied and the results plotted in Graphs 16, 17, 18 and 19. They



Graph 18—Treatment of California cracked gasoline with 93% sulphuric acid effect on gum content

show that there is a definite relationship between the color and color stability and the gum as a function not only of treatment with different amounts of sulphuric acid of constant concentration, for example 93 per cent, but that a similar relationship exists when treating with equivalent amounts of sulphuric acid of varying concentration.

Graph 16 shows a regular decrease in the gum content with increase in amount of sulphuric acid from 2 to 10 pounds per barrel and shows a color of 30 over the whole range of acid treatment of 2 to 10 pounds per barrel and a color stability ranging from 22 to 25 Saybolt. Graph 17 shows that with varying concentrations of sulphuric acid from 60 to 93 per cent, equivalent to 10 pounds of 93 per cent sulphuric acid per barrel, the gum decreases regularly as a function of concentration while color and color stability increase with increasing concentrations. Graph 18 shows a similar effect with California cracked distillate as Graph 16, that is, with a concentration of 93 per cent sulphuric acid and varying amounts, the gum content decreases with increasing amounts of acid. With the California distillate, however, as shown in Graph 19, the color increases with increasing amounts of sulphuric acid from 5 to 10 pounds per barrel, remaining constant up to 20 pounds per barrel and then falling off gradually with 20 to 30 pounds of acid. The latter phenomenon, no doubt, indicates over-treatment.

TABLE 9

Charging stock—	Oklahoma City, Oklahoma topped crude	Lucien district, Kansas topped crude	Smackover, Arkansas topped crude	Black Bayou, Louisiana topped crude	California topped crude
Treatment—Acid, lbs./bbl.	6	6	8	6	10
Octane No.:					
Raw gasoline	72.5	74.0	78.0	80.0	76.0
Finished gasoline	70.0	70.0	77.0	78.0	73.0
Total loss	2.5	4.0	1.0	2.0	3.0
Loss/lb. acid	0.4	0.67	0.13	0.33	0.3
Losses:					
Solution loss	2.4	2.0	2.2	2.2	2.3
Polymerization loss	1.2	1.8	1.8	1.3	1.9
Total loss	3.6	3.8	4.0	3.5	4.2
Loss/lb. acid	0.6	0.63	0.5	0.58	0.42

TABLE 10—TREATMENT OF CRACKED GASOLINE FROM OREGON BASIN (WYOMING) WITH 93 PER CENT SULPHURIC ACID

	Untreated cracked gasoline	Treated cracked gasoline		
Acid, lbs./bbl.	...	6	10	14
Concentration of acid, per cent	...	93	93	93
Solution loss, per cent	...	2.3	3.1	4.2
Polymerization loss, per cent	...	0.9	1.8	1.3
Gasoline:				
Gravity, deg. A.P.I.	58.0	57.6	58.4	57.8
Sulphur, per cent	0.62	0.43	0.36	0.29
Octane number	73	67	66	65

TABLE 11—TREATMENT OF CRACKED GASOLINE FROM OREGON BASIN (WYOMING) WITH 98 PER CENT SULPHURIC ACID

	Untreated cracked gasoline	Treated cracked gasoline		
Acid, lbs./bbl.	...	10	14	20
Concentration of acid, per cent	...	98	98	98
Solution loss, per cent	...	3.4	5.2	7.6
Polymerization loss, per cent	...	2.6	3.7	3.8
Distillation loss, per cent	...	3.5	3.8	3.0
Gasoline:				
Gravity, deg. A.P.I.	58.0	57.7	57.3	56.8
Sulphur, per cent	0.63	0.32	0.25	0.22
Octane number	73	66	65	64

TABLE 12—THE EFFECT OF ACID TREATMENT AND TEMPERATURE ON GUM FORMATION OF A VAPOR PHASE CRACKED GASOLINE

Gasoline treated—	Pounds 93.2% sulphuric acid/bbl.	Temperature treat, deg. F.	Per cent gasoline recovered	Per cent 400° F.E.P. gasoline in Raw gasoline	Per cent 400° F.E.P. gasoline in Treated gasoline	Treating losses based on gasoline Per cent solution	Treating losses based on gasoline Per cent polymers	Mgs. gum/100 cc. copper dish method
Vapor phase	10	70	95.3	90.0	78.8	1.5	11.0	116
Cracked gasoline	10	70	95.2	90.2	79.0	1.5	10.8	156
	10	*18	94.8	90.0	81.5	2.3	8.2	53
	10	18	94.5	90.2	81.5	2.3	8.2	25
	10	*0	94.8	90.0	82.6	1.6	7.2	315
	10	..	95.2	90.2	83.0	1.7	6.8	247

*Some difficulties are noted at the lower temperatures owing to the very viscous character of the sludge.

Graphs 18 and 19 show plots of these data.

The Saybolt color rises sharply to a maximum and then falls off with increasing amounts of acid, while the copper dish gum drops sharply to a minimum and then remains practically constant.

A West Texas distillate was treated with varying amounts of sulphuric acid of varying concentrations. The results with 6 to 12 pounds of sulphuric acid of 80, 93 and 98 per cent concentration are shown in Graph 20. The 80 and 93 per cent concentrations show a maximum in the gum content as a function of quantity of acid, while the 98 per cent sulphuric acid shows a regular decrease. Graph 21 shows the effect of treatment of 10 per cent fractions of a California cracked gasoline, each with 6 pounds of 93 per cent sulphuric acid per barrel. The gum content for this type of treatment increases in the individual fractions with increase in boiling range, whereas the color of the corresponding fractions decreases.

Table 12 shows the effect of acid treatment on the gum content of a vapor phase cracked gasoline with 93.2 per cent sulphuric acid at varying temperatures. The best results were obtained at 18° F. The gum content increases at 0° F. for the same amount of acid. Apparently at the lower temperature the reaction in the removal of gums from vapor phase gasoline of high gum content is somewhat retarded. At 70° F. the gum content was not reduced to the same extent as at 18° F., indicating secondary reactions. The sludge produced is very viscous at 0° F. and polymerization and solution effects are not so marked as at the higher temperatures.

Summary and Conclusions

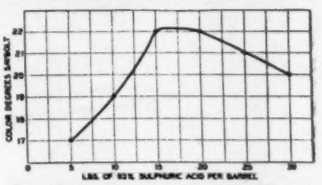
1. In the treatment of cracked distillates, the acid sludge-acid ratio, or the relative volume of acid sludge formed to sulphuric acid used, increases practically as a straight-line function of the temperature.

2. The acid sludge-acid ratio increases with increase in sulphuric acid concentration.

3. The acid sludge-acid ratio decreases somewhat with increasing amounts of sulphuric acid of constant concentration between temperatures of 5° F. and 100° F.

4. Many cracked distillates show an increase in sulphur content with increase in boiling point to a maximum, after which the sulphur content decreases.

5. Increase in concentration of acid



Graph 19—Treatment of California cracked gasoline with 93% sulphuric acid effect on color

increases solution loss and polymerization.

6. Reduction of solution loss is appreciable with reduction in temperature, but is substantially less than the decrease in polymerization.

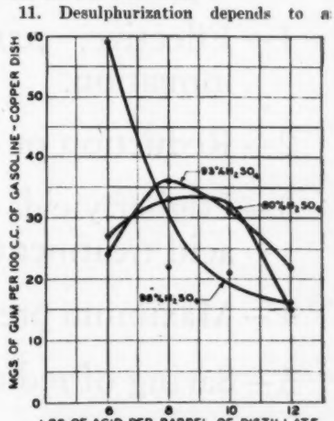
7. Polymerization is a function of all three variables, quantity and concentration of acid and temperature. The decrease in polymerization with decrease in temperature is very marked.

8. In general, treatment of cracked distillates at low temperatures shows a substantial saving in losses of distillate, particularly in respect to polymerization or conversion of gasoline into high boiling components.

9. The degree of desulphurization increases with increase in concentration of acid.

10. Sulphuric acid of 98 per cent concentration is recommended for refractory distillates requiring drastic treatment for desulphurization. A saving in quantity of acid and cost will result.

11. Desulphurization depends to a



Graph 20—Effect of various quantities and concentrations of sulphuric acid on gum content when treating a West Texas cracked distillate

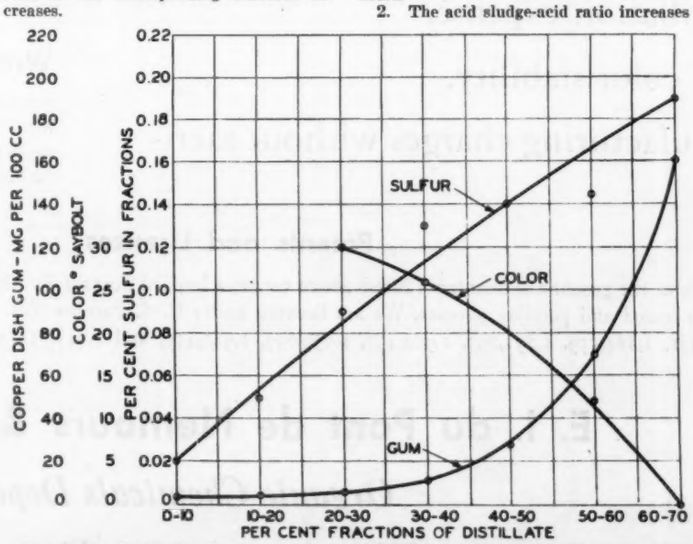
great extent on the character of sulphur compounds, both in respect to the type of distillate and the particular fraction of the same distillate treated.

12. The degree of desulphurization is in general increased by pretreatment of the distillate with caustic or plumbite solutions before acid treatment.

13. Treatment of cracked gasoline with sulphuric acid in general reduces the octane number.

14. The gum content of cracked gasoline decreases with increasing amounts of sulphuric acid of constant concentration and also with increasing concentrations of acid.

15. The color of cracked gasoline improves with increase in amount of sulphuric acid, usually to a maximum, and then may drop off when it is over-treated. The color also improves within limits with constant amounts of acid of increasing concentration.



Graph 21—Variation in gum, color and sulphur content of 10% cuts from California cracked distillate each treated with 6-lb. per bbl. of 93% H_2SO_4

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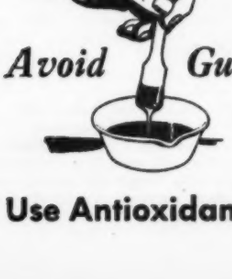

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By C. R. WAGNER
Pure Oil Co.

Five years ago, when the first papers began to appear on the stabilization of cracked gasoline by the addition of minute traces of inhibitors, few people thought that this process would ever succeed in eliminating the time-honored sulphuric acid treating. This attitude may have been due partly to the general reliance which refiners have placed on sulphuric acid ever since Benjamin Silliman first discovered that ill-smelling oils taken from the ground in Pennsylvania could be converted into useful products by the action of sulphuric acid. When the cracking process was developed it was natural to turn to sulphuric acid as the solution to the treating problem. Because of the unsaturated character of cracked gasoline, however, several difficulties were encountered. In the first place, the acid caused a vigorous polymerization of valuable unsaturated hydrocarbons, producing heavy oils of low value and colored resins, making it necessary to redistill the gasoline after acid treating. Unless great care was used, considerable sulphuric acid would be introduced into the gasoline, later appearing as sulphur dioxide on redistillation and causing trouble from corrosion and loss of color in the distillate products. Another problem arose from the difficulty of recovering the sulphuric acid from the sludge resulting from cracked gasoline treating, and it was common practice to dump or burn the sludge rather than attempt to recover the acid from it.

Inhibitor Process

With the inhibitor process all the difficulties inherent in sulphuric acid treating are avoided, and, where cracking units are equipped with fractionating towers which produce endpoint distillate, even redistillation costs are saved. In the older cracking processes the fractionating equipment provided was not sufficient to give endpoint gasoline and redistillation was necessary anyway so that the saving in rerunning cost could not be added as a credit to the antioxidant process. With modern cracking units, however, it has been found distinctly advantageous to provide better fractionation and recycle everything above endpoint gasoline. In addition, the newer cracking units are including stabilization equipment to eliminate propane so that the gasoline from these units meets all requirements for marketing directly off the unit with the exception of gum stability and possibly sweetening where that is a requirement. With this situation it is easy to see that the antioxidant process offers a great many advantages as it is only necessary to add to the gasoline the correct amount of the antioxidant to make it a satisfactory motor fuel in all respects. Where sweetening is required this can be accomplished by a fairly simple contact with doctor solution before adding the antioxidant.

The development of gasoline antioxidants from the laboratory to the plant scale has brought to light several problems which could only be solved by actual use of these materials on the large scale. The Pure Oil Co. was one of the first to use antioxidants in its regular production and is probably the largest user of gasoline antioxidants today, treating more than 10,000,000 bbls. of gasoline annually by this process. One of the first difficulties encountered with the use of antioxidants was the problem of water solubility. In the storage and handling of gasoline it is very difficult, if not impossible, to prevent entirely the access of water to storage tanks. Moisture from the atmosphere which is breathed into the tank condenses and forms a water layer which may be sufficient to extract antioxidants which are highly water soluble. An example of one material of this class is catechol which is a very good gum inhibitor but because of the fact that it is much more soluble in water than in gasoline its use is not reliable. This difficulty of extraction by water has been overcome by the selection of materials which have a favorable gasoline to water solubility coefficient. One of the best of these is dibenzylaminophenol. Mono-benzylaminophenol is also more soluble in gasoline than in water.

TABLE 1—EXPERIENCE WITH "Q" GASOLINES

Per cent composition of blend			Induction period (Steel bomb test)			
Vapor phase	Liquid phase	Straight-run	No inhibitor (min.)	With inhibitor (min.)	Inhibitor added lb./1,000 bbls. (42) of blend	c.c. Lead/gal. in blend
30.8	18.0	51.2	270	390	3.47 (.00136%)	1.0
20.0	72.0	8.0	210	450	4.0 (.00157%)	.50
24.0	39.0	37.0	210	420	6.0 (.00236%)	None
17.0	46.0	37.0	255	540	9.5 (.00373%)	.5
29.5	18.0	52.5	330	480	2.42 (.000952%)	1.3

Uniform Distribution

Another problem was the difficulty of obtaining uniform distribution of an extremely small amount of antioxidant in a large volume of gasoline. Several methods can be used, such as recirculating a given lot of gasoline in a tank and adding the inhibitor either to the tank or to the recirculating line at the pump. This method requires considerable extra pumping, and we have adopted the method of continuously adding the inhibitor to the gasoline stream which is being pumped from the receiving tanks to storage. The figure shows the equipment which is in use at all our plants for this purpose. It is a rotary "proportioner" which may be obtained in any suitable size. The gasoline flowing through the rotor controls the operation of the proportioning pump which is driven by compressed air. A solution of the antioxidant is made up in the solution tank and flows by gravity to the proportioning pump which injects it into the gasoline stream through a nozzle in any amount desired. For the past year and a half we have been using a 50 per cent solution of benzylaminophenol in denatured alcohol or methanol, and with this apparatus we have encountered no difficulty in introducing as little as 2 quarts of the inhibitor solution to 1,000 bbls. of gasoline with absolute uniformity. This amount corresponds to a concentration of inhibitor in the gasoline of approximately .001 per cent.

Use Nozzle for Mixing

The use of a nozzle for introducing the solution into the gasoline stream is rather important when using concentrated solutions. The apparatus in use has a nozzle drilled with a very small hole which gives a very fine stream and insures complete dispersion of the inhibitor. If the solution is introduced at too low velocity, there is a tendency for the solvent to become extracted and drop the inhibitor out of solution before it becomes dispersed. We have had complete success with this arrangement. We have equipped our solution tanks with hand-operated paddle agitators to aid in dissolving solid inhibitors in the alcohol or other solvent. However, it is now possible to purchase many of these inhibitors already in solution so that the agitator is not required. The inhibitor supply tank is conveniently charged from the drums in which the inhibitor solution is shipped by introducing a charging connection going to the bottom of the drum and applying compressed air to the drum to force the inhibitor into the supply tank. The tank is provided with a tight cover to prevent evaporation of solvent. We have found it very desirable to cover the solution of inhibitor with a 2 or 3-inch layer of gasoline. This prevents evaporation of the solvent and insures washing out lines and pump parts with gasoline after delivering the inhibitor into the gasoline stream. In this way plugging of the orifices and valves by crystallization of inhibitor is avoided.

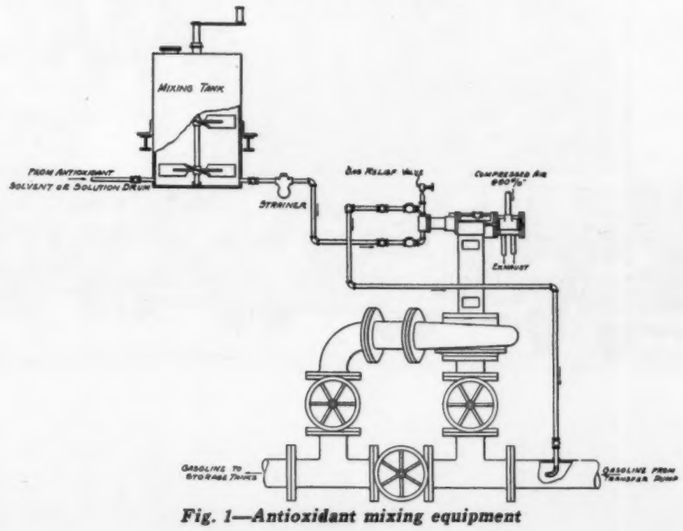

Fig. 1—Antioxidant mixing equipment

Our Gyro gasoline is not treated with acid but is filtered in the liquid phase through clay, with a yield of about 60,000 bbls. per ton of clay. This clay treat can be applied to the hot stabilized gasoline directly from the base of the stabilizer tower attached to the cracking unit. After the clay treat the gasoline is flash distilled, and has a gum stability in the range of 200-300 minutes induction period, determined by the steel bomb test[1]. Sufficient antioxidant is added to bring up this induction period to a minimum of 450 minutes. The amount required lies ordinarily between around 4 to 7 pounds per 1,000 bbls., being less when the clay is fresh. The amount is easily increased to compensate for loss of clay activity as the yield per ton increases.

Gasoline in Storage

When cracked gasoline is placed in storage, such as summer gasoline which is made in the winter time, some loss in stability occurs during storage, and it is usually desirable to have a stability well above the minimum at the time of production, so that when the gasoline is shipped it will meet the minimum stability requirement without the necessity of additional antioxidants. Also, when stabilizing cracked gasolooine to be later blended, it is sometimes desirable to allow for a slight loss of stability on blending, especially if the other stock is a straightrun gasoline which has aged.

We have found that the stability of cracked gasoloine is reduced somewhat by the addition of "Q" and Ethyl fluid. Table 1 illustrates the effect of benzylaminophenol on several "Q" gasoline blends made at different refineries.

It has been found possible to modernize liquid phase cracking installations where high endpoint distillates were formerly made and pay for the cost of such modernization in one year's time by use of the antioxidant treating process. In such cases the cost of acid treating and rerunning together with the loss of gasoline boiling point fractions incurred in such treating and rerunning minus the cost of inhibitor now used has been enough to amortize the new investment in nine months to one year. Although this company originally interested itself in antioxidants because of its production of vapor phase cracked gasoline, it has proved to its own satisfaction the economies possible in the treatment of liquid phase cracked gasoline by means of the same antioxidants. For example, a cracked distillate, freshly produced, without clay treatment or any other treatment except neutralization with caustic soda, was brought from a 200-minute induction period to 650 minutes by the addition of 0.0025 per cent (6.35 pounds per 1,000 bbls.) of monobenzylaminophenol.

A further striking advantage of the antioxidant process is the ease with which stocks can be protected in marketing areas. Frequent laboratory checks on gasoline in tanks where turnover is slow make possible accurate predictions of potential trouble and enable operators to add additional inhibitor in time to prevent any difficulty. Such a process makes possible the marketing with safety of gasoline that would otherwise have to be returned to the refinery for redistillation, or which might cause trouble if marketed without being treated.

[1]Ethyl Gasoline Corp. method.

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Sanction No. 3001

Pictures show AAA officials who supervised every detail of this daring test, and the six cars that were driven to destruction to prove which oil was best.

NEW and IMPROVED CONOCO

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Evidence!

ABOVE: the final fill of five quarts of each brand of oil of the same S.A.E. grade.

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THE HIDDEN QUART STAYS UP IN YOUR MOTOR AND NEVER DRAINS AWAY

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GERM PROCESSED MOTOR OIL

Steady Improvement in Refinery Design Reflects Demand for Better Products at Lower Costs

By JACKSON R. SCHONBERG
Standard Oil Development Co.

The first commercial installations for heating and cracking oils to gasoline were Burton stills and Burton-Clark pressure stills, built along the lines of a water tube boiler. These operated semicontinuously at about 110 pounds pressure and about 800° F. temperature. During the last decade, these stills have been almost completely replaced by various types of continuously operated cracking units, using coil heaters rather than stills. One of the widely used commercial units at the present time is the so-called "Tube and Tank" cracking coil, developed by the Standard Oil Co. of New Jersey. Since this unit includes all the major process features that are typical of the art of cracking, it can well be used as a basis of discussion.

Oil is pumped under pressure through a pipe coil in a furnace, in which it is heated to the cracking temperature desired. Part of the cracking occurs in the coil, the remainder, without further addition of heat, in an insulated reaction chamber. From this chamber, the reaction products are released to a series of drums and towers, where the fractions, beginning with the heaviest, are separated. The final products—gasoline, gas and tar, or coke—are cooled and withdrawn, but the incompletely cracked portions of the feed stock are separated hot and mixed with the makeup oil, or fresh feed, to be returned to the furnace for further cracking.

The fresh feed stock may be one of three types: (1) a reduced crude remaining after distillation of the lighter components of crude oil, such as gasoline and kerosene, (2) a gas oil, which is a distillate cut off the crude after the kerosene has been removed, or (3) heavy gasoline fractions. The object of cracking reduced crude or gas oil is the production of gasoline, but the object of cracking gasoline is the improvement of its quality. Cracking gasoline improves its octane number (or knock rating) and increases the fill. Fill may be defined as the content of low boiling fractions which give easy starting of gasoline engines, but are not so volatile as to cause vapor lock.

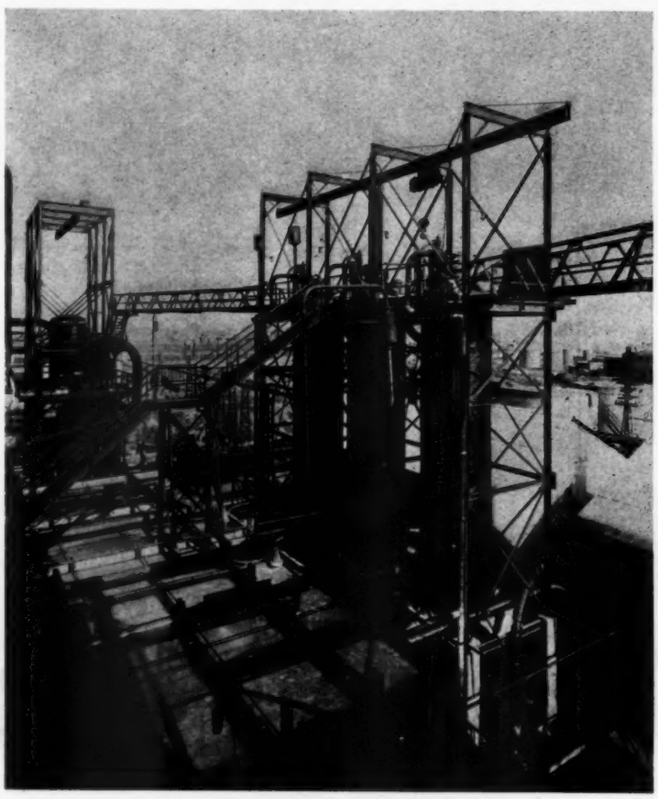
Effect of Pressure

In taking up the variation of operating conditions to suit these feed stocks and products desired from them, the effect of pressure will be discussed first. Generally speaking, a low pressure in the reaction chamber is conducive to increased yields of gasoline when cracking gas oil or reduced crude. Higher pressures have the advantage of increasing the capacity and improving the quality of the gasoline, particularly when feeding light stocks, that is, heavy gasoline fractions. Thus, the optimum pressure may vary from 250-400 pounds for heavy reduced crude to 750-1,000 pounds for heavy gasoline fractions. In general, the trend is toward operations yielding less tar and more gasoline.

The temperature to which the oil is heated for cracking is generally set as high as possible in order to obtain rapid cracking with resulting high capacity and to obtain the best octane number gasoline. The practical limit to which the temperature can be raised is fixed by the increased tendency of the oil to coke in the heater or reaction chamber. Heavy, dirty oils, even if present only to the extent of a small fraction of the oil heated, limit the cracking temperature to 850-900° F., but light, clean stocks can be cracked up to 1,000° F., or more.

The time allowed for reaction is kept as short as possible in order to reduce the formation of gas and tar as by-products, but must be enough to avoid excessive recycling of incompletely cracked products for further cracking.

The advantages to be gained by cracking each type of feed stock under its own optimum type of operating conditions have led to careful segregation of feed stocks. That is, reduced crudes are cracked separately from gas oils and the latter separately from gasolines. Particular care is used to keep light stocks free of contamination by small amounts of heavy, dirty, high boiling fractions.



General view of part of distillation equipment at the Bayonne, N. J., refinery of the Standard Oil Co., of New Jersey

Separation of Products

Next to the reaction itself, the most important part of the cracking process is the separation of the products. Coke deposits in the reaction chamber, usually to the extent of less than one-half per cent in yield on the fresh feed, and is removed at the end of a run. Tar, varying from 65 per cent yield on a reduced crude operation to 5 per cent yield on a gasoline operation, is separated as a liquid from the vaporized products in an evaporator and is withdrawn continuously through a cooler. The vaporized products are cooled as they pass through one or more towers and successively lighter products removed by fractionation, the final separation being between gasoline and gas. The latter will be discussed in more detail later.

Combined with the above mentioned fractionation system, for purposes of heat economy, is a heat exchange system, in which the makeup oil is pumped countercurrently to the flow of products through the fractionation system. Heat transfer is obtained either indirectly in tubular exchangers or directly by letting the makeup oil flow down over bubble cap plates through which hot vapors are rising. The preheated makeup oil is mixed with hot recycle oil in an accumulator, after which still further preheat may be gained by pumping the mixture through high pressure exchangers on the way to the heating coil.

The principal recent trend in cracking coil fractionating equipment is toward higher pressures. Early installations operating at atmospheric pressure have been largely replaced by fractionating towers built for about 100 pounds operation, and new equipment is frequently designed for 200 pounds. The chief advantage of the higher pressure is the increased preheat that can be obtained due to the raising of boiling points throughout the system. Other trends are toward more direct contacting with less use of heat exchangers, and closer fractionation to give more nearly commercially salable products direct from the cracking unit. In some units, the distillation of the crude oil is combined with cracking, so that crude oil can be fed in at one end and gasoline, requiring only chemical treatment for finishing, withdrawn at the other end.

Other Types of Units

In addition to the modern "Tube and Tank" unit described above, there are many other types of cracking units, the basic differences being in the furnace, reaction chambers, and tar separators. Some units use side wall as well as roof tubes in the radiant section of the furnace, and use horizontal rather than vertical reaction chambers. As an alternative to a reaction chamber, some furnaces are built with a section of low heat input tubes where oil is held at nearly constant temperature while conversion to gasoline takes place. Other units charge only light, clean fractions to the furnace coil, heating them to a very high temperature. After utilizing heat exchange to bring up the temperature of the heavy fractions as much as possible, they are charged, without the application of fired heat, to the same reaction chamber as the light stocks. If the tar produced is recycled in this manner to the reaction chamber, it can be run down to a solid coke. Vapor phase units operate without a reaction chamber at less than 100 pounds per square inch coil outlet pressure and in the region of 1,100° F. coil outlet temperature.

Furnace Design

In accomplishing the process changes that have been outlined above and in improving cracking operations generally, it has been necessary to solve a number of mechanical problems. The most important of these have to do with the furnace containing the heater coil.

Oil furnaces have not yet approached boilers in completely utilizing the walls of the combustion space for picking up useful heat. The rate of heat liberation per cubic foot of combustion space has recently been increased from 3,600 B.t.u. per hour to 7,500 or more B.t.u. per hour, but is still very far short of boiler practice. The principal obstacle to more complete utilization of the combustion space walls and corresponding higher heat liberation has been the necessity of making all the tubes accessible for cleaning. Otherwise, a long cleaning time after each run would mean excessive fixed charges for this down time, not alone on the furnace itself, but on the whole cracking unit, which costs many times as much as the furnace. The average rate of heat transfer to the oil has also been increased, rising from 10,000 to about 15,000 B.t.u. per hour per square foot of nominal external tube surface in the radiant section, and from 7,000 to about 12,000 B.t.u. per hour per square foot of nominal surface in the furnace as a whole. Usually 50 to 60 per cent of the heat is put into the oil in the radiant section. To increase the heat transfer coefficient through the oil film on the inside of the tubes and to aid in preventing coke deposition, oil velocities in the radiant section tubes have been approximately doubled, now being of the order of magnitude of 20 feet per second. These high velocities make it possible to go to higher oil temperatures in safety, since the temperature difference between oil and metal temperature is reduced. This is of considerable importance, since we are limited in tube metal temperatures to a maximum of 1,200° F. for the best alloy tubes, due to pressure and temperature stresses. Temperature stresses, it will be recalled, are caused by differences in temperature between the outside and inside surfaces of the tubes, due to flow of heat through the tubes.

Two general methods have been developed to aid in reaching high temperatures and pressures. The first consists in arranging the tubes and the flow of oil through the tubes, particularly in the

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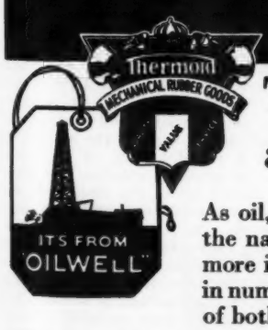

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radiant section, so as to stress each tube to about the same percentage of the safe limit for that working metal temperature. The second is to use alloy steel for tubes, such as 4 to 6 per cent chrome steel, containing about one-half per cent molybdenum. For the most severe conditions, an alloy containing 18 per cent nickel and 8 per cent chromium is used. These alloys are also sometimes used for pipe lines in units running high sulphur, corrosive stocks, since they are highly resistant to corrosion. The fractionating towers and drums are usually made of ordinary steel with extra thickness allowed for corrosion, as necessary. Concrete lining is used as a corrosion preventive in soakers and other high temperature drums.

Types of Pumps

The most difficult pumping problem is that of charging the mixed fresh and recycle feed to the furnace at temperatures up to 725° F. and discharge pressures up to 1,300 pounds per square inch. Up until about four years ago, the majority of pumps for this service were of the direct acting, twin simplex, plunger type with ordinary simple or compound steam ends. In recent construction and replacements, there has been a change to other types, which operate more efficiently and with less fluctuation in discharge pressure. Types in common use include centrifugals with direct connected motor steam turbine or dual drives, crank and flywheel plunger pumps with direct connected steam or gas combustion cylinders and crank and flywheel plunger pumps driven through reduction gears by a steam engine or motor. Refinery fuel, power conditions and exhaust steam balance largely determine whether the motive power shall be steam, electricity or refinery gas. Small throughputs tend to favor reciprocating pumps and large throughputs, centrifugals.

As mentioned previously, the cracking process was developed to meet the enlarged demands for gasoline, a market which has expanded far ahead of the requirements for the other products obtained from crude oil. It is apparent that the work of recent years has stressed increasing the yield of gasoline and reducing the yield of tar.

Hydrogenation

The next step in the development of gasoline production has been to design a process which will convert the available heavy oils to gasoline and a small quantity of gas, with a complete elimination of tar production. The German I. G. Farbenindustrie pushed the development of a process called "hydrogenation" to produce good yields of gasoline from coal and coal tars. This process has now been applied to many of the petroleum refiner's problems, but at the moment only its use to produce gasoline will be considered.

Hydrogenation consists of treating oil at high temperatures and pressures with hydrogen in the presence of a catalyst. In general terms, the hydrogen, with the help of the catalyst, prevents the formation of tar or coke, both of which are normally produced in cracking. The process is conducted at temperatures in the same range as used in cracking, but at pressures in the neighborhood of 3,000 pounds per square inch. Since this process has received wide publicity in both the news and technical press, it will probably be of interest to outline the essential parts of such a plant. The unit consists of fired coil, reaction drums, and heat exchangers. The parts are the same as the three essential parts of a cracking coil, however, with the differences that hydrogen is fed into the system and the high pressure drums contain catalyst in the form of small lumps. Of course, such a plant consumes large quantities of hydrogen and must have an adequate supply of this material. Hydrogen is manufactured in a separate plant, from the gas which has been produced in the high pressure drums during the formation of the gasoline. Thus, the gas is consumed in secondary operations, and only one product is obtained from such a hydrogenation plant, namely, gasoline. The yield of gasoline varies from 85 to 115 per cent by volume, as compared with cracking yields of 40 to 70 per cent. At first glance, it may appear that yields in excess of 100 per cent are impossible; however, this can be explained by the fact that the figures given are volume per cents and that gasoline has a specific gravity about 25 per cent lower than the oil fed to the unit.

The design of equipment for such high temperature and high pressure service has necessitated the extensive use of alloys such as chrome vanadium, chrome nickel and chrome molybdenum steels. In addition to withstanding the pressure stresses at high temperatures, these metals must be corrosion resistant to the attack of both hydrogen and hydrogen sulphide.

The hydrogenation process has been operated over five years in Germany and over three years in the two plants which have been constructed in this country. It might be mentioned, in passing, that the United States plants have been in service most of this period in the production of lubricating oils, which will be discussed later, and only a short time on gasoline.

Gasoline From Gas

The necessity of cracking heavy naphtha for octane number and fill, has increased the amount of noncondensable gas formed in the cracking process. This gas, while consisting for the most part of very light hydrocarbons outside the gasoline range, contains, in addition, sufficient heavy hydrocarbons of gasoline value to make their recovery a necessary procedure. In addition to the cracking process, many other refinery operations produce gas, and this is combined with the cracking coil gas for gasoline recovery.

The simplest and oldest method of recovery consists in compressing the gas to a high pressure, condensing and weathering off from the condensate as much of the undesirable light ends as possible. By "weathering" is meant evaporation of a portion of the liquid, in which process more light ends are removed than heavy ends. Due to the poor recovery of gasoline and the fact that many undesirable light ends remain in the gasoline, this process is obsolete in refinery practice at the present time, although it still finds some use in the oil fields.

Oil absorption is the method of recovery adopted by practically all refineries at the present time, and consequently this process will be discussed in some detail. The simplest type of a complete oil absorption plant consists of compressors, an absorber tower in which oil and gas are passed counter-currently, a steam still in which the absorbed gasoline is separated from the oil and condensed, and recompressors which compress the uncondensed gases from the steam still to a pressure considerably higher than the initial absorption pressure for further gasoline recovery. The oil menstruum is usually a light gas oil or kerosene of as low a molecular weight as possible, since the lower the molecular weight, the greater the absorption capacity. The oil leaving the absorber contains absorbed gasoline and is known as "fat oil"; it is preheated in a steam heater and denuded of its absorbed components in the steam still, whence it is cooled to as low a temperature as possible by heat exchange and water cooling, and returned to the absorber for further use. The majority of undesirable components in the original gas pass unabsorbed through the absorber and are vented to the refinery burning system. The rating of a plant is determined by its gas capacity and maximum possible butane recovery. Butane is the lightest hydrocarbon component in the gas suitable for gasoline, and because of its high volatility, is the most difficult of the gasoline components to absorb and recover.

Although it was long known that the quantity of oil circulated through an absorption plant for a given recovery was approximately inversely proportional to the absorption pressure, low absorption pressures, varying from 10 to 30 pounds per square inch were the rule in refineries until a few years ago. Absorption plants recovered at that time approximately 30 per cent of the butane in the refinery gas, and most of the heavier gasoline components, the balance of the light gasoline fractions required in the refinery being purchased from the oil fields as "casinghead," a very light gasoline recovered from natural gas.

In order to reduce the quantity of purchased casinghead and make the refinery more self-sufficient in gasoline production, the trend in absorption practice during the past few years has been to recover greater and greater amounts of butane, until at the present time plants capable of recovering 90 per cent of the total butane in the gas are in general use around the country.

Increased butane recoveries have led to increased refinements in absorption plant design. To economize on the amount of oil circulated, absorption pressures have been raised to 80 pounds per square inch, and higher. To reduce the quantity of uncondensed gas from the steam still system, which formerly required recompression or reabsorption, and at the same time economize on steam consumption, two steam stills, in series, are now commonly used. The first still makes an easy, rough separation of the lighter absorption naphtha fractions from the oil menstruum at a pressure such that practically the entire overhead may be condensed (usually 80 to 100 pounds per square inch). The remaining easily condensable heavy fractions are separated completely from the oil in the second still, which operates at about 5 pounds per square inch. This low pressure in the still, where the difficult separation of the last trace of gasoline from the oil occurs, results in exceptionally low steam consumption.

Eliminating Light Ends

One of the problems resulting from increased butane recoveries has been the necessary elimination of the large amount of undesirable light ends included in the recovered gasoline, which operation is known as stabilization. This is accomplished by rectifying the gasoline in a fractionating tower, having about 30 plates and operating at pressures around 200 pounds per square inch. Here a stable gasoline is produced as a bottoms product, and a "dry" gas is taken overhead and released into the refinery gas burning system.

An interesting simplification of the usual absorption plant is sometimes possible, consisting in the operation of an absorber in conjunction with cracking coil equipment. In one variation, cold fresh feed to the cracking coil is used as the absorption menstruum, the absorbed light gasoline being flashed off in the cracking coil distillation equipment and condensed along with the normal cracked naphtha distillate. In a second variation, hot gas oil is removed from the cracking coil bubble tower, cooled, passed through the absorber tower, and recycled back to the cracking coil, the absorbed gasoline here also being flashed off in the distillation equipment and condensed with the cracked distillate. The results of either system are the same—that is, the usual absorption plant steam stills are eliminated and waste heat from the cracking coil is used for distillation instead of steam. The undesirable light ends normally present in the absorption naphtha now appear in the cracked naphtha distillate, and it is consequently necessary to stabilize this distillate. This process will be taken up a little later.

A still further simplification of gas recovery plant design has been effected in the last few years, which not only eliminates steam still equipment but also eliminates the absorption step itself. In this method, all gas is compressed and introduced into a fractionating tower having about 30 plates and operating at pressures varying from 200 to 400 pounds per square inch, depending upon the be-

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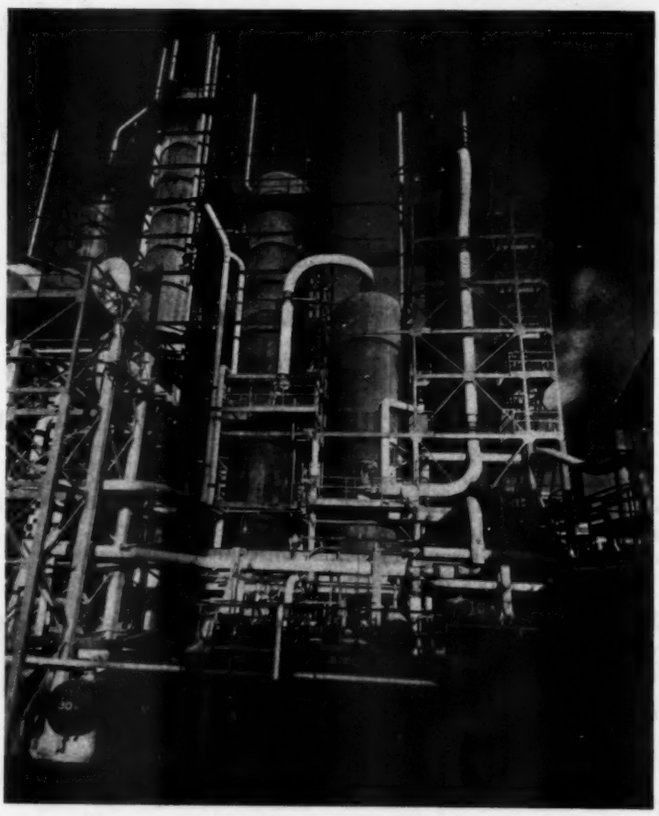

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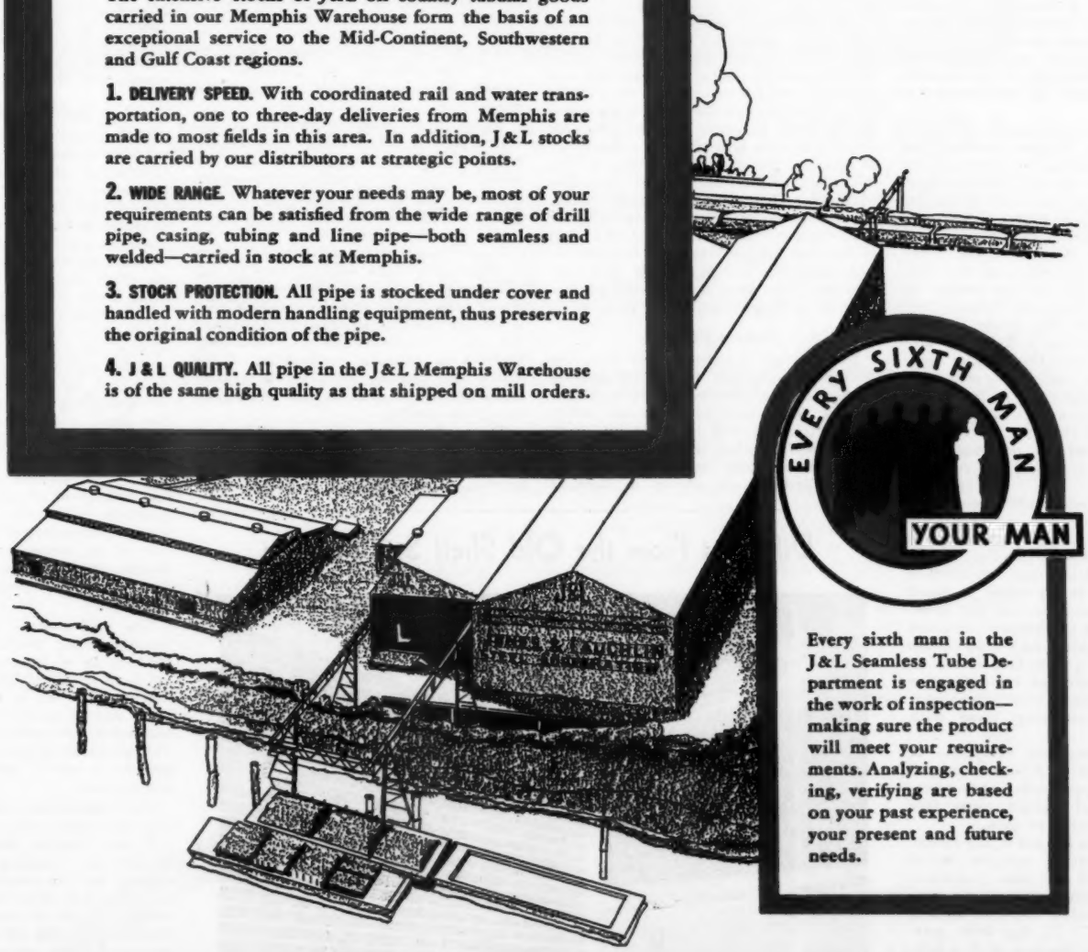

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tane recovery desired. The gasoline components of the gas feed are removed from the tower as a stable bottoms product, the remainder of the gas being taken overhead and released into the refinery gas burning system. The simplification in equipment is more or less counterbalanced from a cost standpoint by the high operating pressures, and only a few of these plants have been installed to date.

Stabilization Operations

The trend toward more intense cracking of oils and heavy naphthas has not only tended to increase the gas production of refineries but, at the same time, has tended to produce very volatile cracked gasoline containing considerable amounts of hydrocarbons lighter than butane. These light hydrocarbons have no gasoline value and are very undesirable, since they cause high evaporation losses and produce vapor lock in automobiles if not eliminated from the gasoline. Various methods have been developed for stabilizing cracked gasolines, and these will be taken up briefly.

The simplest method, which, however, only practically stabilizes the gasoline, is to condense the distillate from the cracking coil at a comparatively high temperature. This has the disadvantage of producing a large amount of gas for the gas plant to handle and, at the same time, does not eliminate all the undesirable light ends, since no fractionation is involved.

A more recent development is known as debutanization. Cracked distillate, as it leaves the cracking coil worm under pressure, is passed through heat exchangers and introduced into a fractionating tower having 10 to 20 plates and operating at pressures around 100 pounds. Heat is supplied at the bottom of the tower by recirculating a portion of the bottoms through a tube furnace similar in design to the cracking coil furnace previously described. In this tower, a rough separation is made and a light cut taken overhead, such that the gasoline leaving the bottom is entirely stable. The overhead cut contains many of the lighter gasoline components and is blended with absorption naphtha from the gas recovery plant and stabilized as previously described in the discussion of gas recovery plants.

From a heat economy standpoint, this method of debutanization is not always desirable, as it entails, first, cooling and condensing the cracked gasoline in the cracking coil worm to a low temperature and then heating it up again to about its original temperature in the debutanizer. In a recent development, this has been avoided by taking, as a side stream from the cracking coil bubble tower direct, a hot heavy naphtha cut containing only a small proportion of undesirable light ends, and removing these with steam.

Many other types and variations of cracking coil distillate debutanizers and stabilizers are in use today, but space limitations will not permit going into the distinctive features of each.

Before leaving the subject of the lighter petroleum hydrocarbons, mention should be made of some of the more important by-products now being marketed by various refining companies. Pentane, with a boiling point of 97° F., has been marketed for some time. Butane, with a boiling point of 30° F., is now used as a fuel by many industries, and mixed with air, is distributed as a gas to homes in many small towns not large enough to afford an artificial gas plant. Propane, with a boiling point of —43° F. and having many trade names, is used extensively in cylinders as a domestic fuel in homes where a normal gas supply is not available. Even ethane, with a boiling point of —128° F., is beginning to assume commercial importance and, as years go by, may also become an important by-product of the petroleum industry.

Trends in Lubricating Oils

Until now the discussion has been confined to the trends in gasoline manufacture—taking up the modern cracking coil, hydrogenation plant, and up-to-date methods of gasoline recovery from refinery gases. The subject of petroleum refining is long, so it will be necessary to skip over the less important intermediate products and confine the remainder of the discussion to trends in the manufacture of lubricating oils.

In order to meet the present-day specifications of a premium grade oil, there are certain requirements with which a lubricating oil must comply. The first consists of a low pourpoint, which will be discussed later in connection with dewaxing. The second, equally as important as the first, consists of a flat viscosity-temperature curve, numerically evaluated by the Standard Oil Co. "viscosity index." It is important that an oil have a sufficiently low viscosity at normal winter temperatures to permit of easy turning over of the automobile engine, and yet at the same time retain adequate viscosity at normal engine operating temperatures to properly lubricate the engine. In addition, the oil must lubricate without excessive carbon formation and without excessive consumption, and should be stable toward oxidation. It is also necessary that lubricating oils meet the gravity and color specifications required by the trade.

The undesirable features of certain oils were early recognized to be due, for the most part, to the high content of asphaltic and aromatic components, and sulphuric acid, due to its availability and cheapness, was the first reagent used commercially for their removal. The acid treating process was subject to many disadvantages, however. There was a definite limit to the improvement in quality possible, and for many inferior crudes the quality of acid required for a given improvement was so high and the yield of finished oil so low that the process was impractical. Consequently, considerable study has been put into the development of more successful processes.

Solvent Process

Two modern processes have been developed commercially for the production of high grade lubricating oils—solvent treating and hydrogenation—of which solvent treating will be taken up first. Unlike acid treating, which relies for its effectiveness upon chemical reactions, solvent treating is purely a physical process; by the use of a selective solvent, aromatic and other undesirable unsaturated compounds are dissolved out and separated from the desired paraffinic portion of the oil.

The most important quality desired in a solvent is a high preferential solubility for the unsaturated and other undesirable components of an oil, which are responsible for low viscosity index, high carbon residue and high sulphur content. In addition, the solvent should be inert and stable, and of such a nature as to effect the maximum separation possible in the shortest possible time after extraction.

Many types of solvent have been studied, and numerous solvent processes have been developed. Among these are processes utilizing crotonaldehyde, acrolein, furfural, nitrobenzene, mixtures of liquid sulphur dioxide and benzol, B.B.' dichlorethyl ether, mixtures of propane and cresol, and anhydrous phenol—the latter being a development of the Canadian subsidiary of the Standard Oil Co. (New Jersey).

A phenol extraction plant which has been in successful commercial operation for a period of three years will be discussed in order to outline the main features of design and operation of solvent treating plants. The plant operates in such a manner that the distillate is continuously treated and separated into extract and finished oil portions, the phenol being continuously reclaimed and reused.

There are three important factors which have a direct bearing on the improved character and yield of the finished oil; they are—treating temperature, proportion of phenol to oil, and method of contacting phenol and oil.

The treating temperature limits are the miscibility and solidification points of the mixture. In general, greater improvement in quality, but lower yields, result from higher treating temperatures. A similar effect is obtained by increasing the ratio of phenol to oil. Obviously, there is an optimum combination of the above two factors, and this is usually developed for any given feed stock and any given quality.

The plant consists of a counter-current phenol treater, a raffinate dephenolizer unit, and a phenol recovery unit for the extract. Oil is preheated to 110 to 225° F. and treated counter-currently with phenol in a seven-stage treating system. The raffinate, containing 8 to 15 per cent phenol, is removed continuously from the last stage and sent to the dephenolizer unit; the extract, containing 70 to 75 per cent phenol, is removed continuously from the first stage and sent to the phenol recovery unit.

The dephenolizer unit consists of a pipe coil heater, a 14-plate atmospheric fractionating column and a six-plate vacuum stripping tower. The treated oil is first heated in the pipe coil and then discharged into the atmospheric fractionating tower, where the majority of phenol is removed. The bottoms from this tower are discharged into the vacuum stripper, where the last traces of phenol are eliminated, and the finished oil is cooled and pumped to storage.

The phenol recovery unit is larger, but essentially the same as the dephenolizer unit. The extract and phenol are separated in the same manner as the finished oil and phenol are separated in the dephenolizing unit. Unlike the acid treating process, in which a heavy, viscous sludge, suitable only as a low grade fuel, is produced, the extracted oil from the phenol process has not undergone any chemical change and because of its aromatic nature can be cracked to yield high octane number gasoline or can be readily oxidized to yield asphalt.

Hydrogenation Method

The second successful commercial process for improving the quality of low grade lubricating oils to premium grade is, as mentioned previously, hydrogenation. Unlike solvent treating, which is purely a physical process, hydrogenation involves chemical reaction between hydrogen and oil and molecular rearrangement of the oil. This process is carried out in the same plant and utilizes the same flow as described previously in the discussion of gasoline manufacture by hydrogenation, so that it will not be necessary to go over again the details of design or operation. Of course, for the production of lubricating oils, the charge stock to the plant is a lubricating oil distillate and not a gas oil, such as is used for gasoline production.

As with solvent treating, the yields and quality of oil are excellent. The by-products, however, differ materially, since hydrogenation yields gasoline and gas oil as secondary products, both of which are considerably more valuable than the extract produced in the solvent processes.

The utilization of the same plant for manufacturing gasoline and improving the quality of lubricating oils is an example of the flexibility of the hydrogenation process. As a matter of fact, the plant can be used equally well for several other hydrogenation processes, also. This generally adaptability makes of this process a handy tool for the refinery management.

The lubricating oils produced, even with the above expensive treatment, are still not suitable for the market. Although the majority of the aromatic, resinous and unsaturated compounds have been removed, there remains a compound which is solid at room temperature and which causes the oil to gel at low temperatures. These compounds are saturated paraffin waxes and the temperature at which the oil gels or ceases to flow is called the pourpoint. In some cases, the pourpoint of a treated heavy oil may be as high as 120° F.

Removal of Wax

Evidently, a product with this characteristic could not be used as a lubricant for other than high temperature services, as at temperatures below its pourpoint the oil will channel when pumped. To be suitable for normal lubrication, the majority of oils must have a pourpoint of about 0° F. to 20° F., the present trend being toward the lower temperature.

Some oils with low pourpoints exhibit a cloudy appearance before reaching their pour. This characteristic is due to the formation of a small percentage of high

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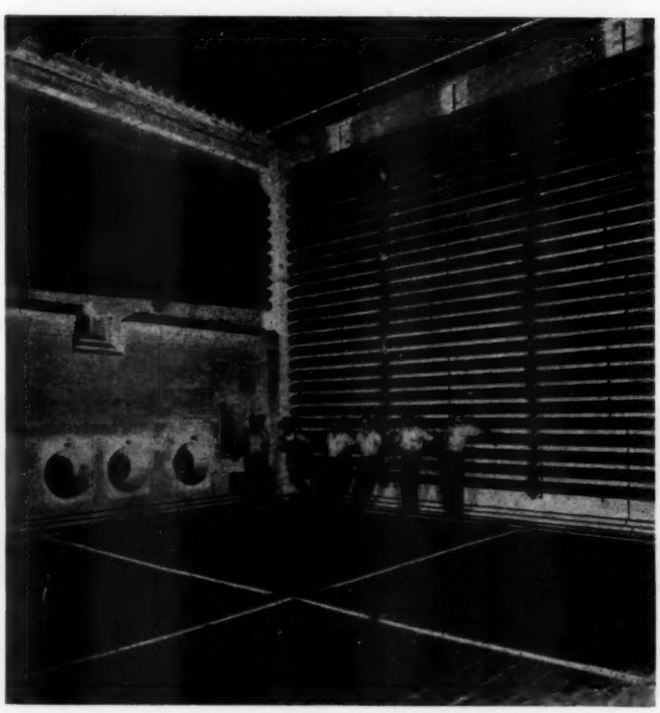
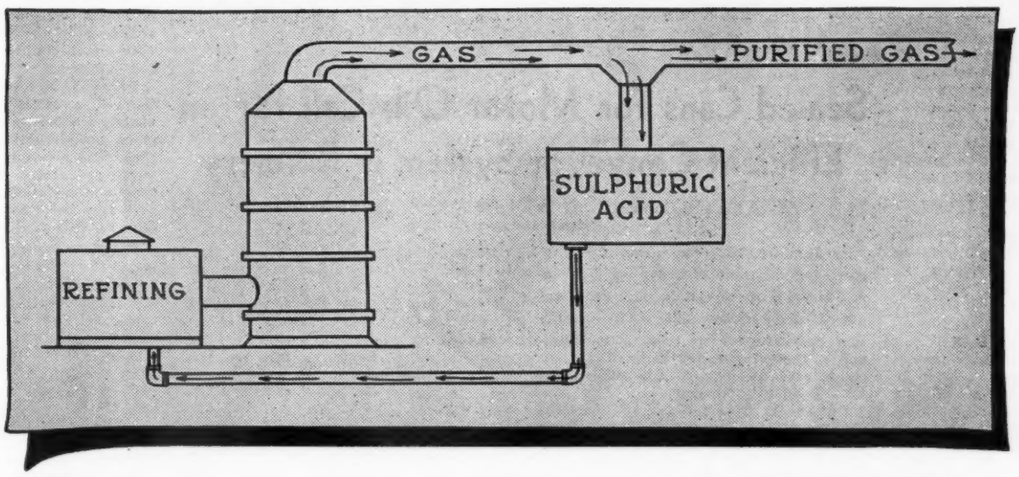


The firebox of a modern cracking unit recently placed in operation



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melting point wax and is also not acceptable to the trade.

The paraffin compounds are very stable and resistant to the action of acids or alkalies. However, they can be removed mechanically by solidifying. A peculiar feature of the paraffin hydrocarbons is that those present in low viscosity oils form large interlocking crystals, known as paraffin wax, which may be removed by cold pressing, whereas those in high viscosity oils form small crystals known as amorphous wax or petroleum. This wax can be removed by cold settling or centrifuging, but up to recent years could not be cold pressed. The intermediate viscosity stock between these two cuts contains a mixture of the two waxes and, up to recently, could not be handled effectively by either method. This stock was usually cracked to gasoline and was known as a slop cut.

The presence of paraffin in petroleum was discovered in a rather interesting manner. A batch of Pennsylvania oil, which was known to be solid at a certain temperature, happened to stand in storage over the winter. When the oil was finally processed, it was noticed that its pourpoint was considerably lower. This, of course, led to experimentation on cold settling and a process was finally evolved for the removal of petroleum from heavy lubricating oils by diluting with naphtha, chilling to a low temperature and allowing to settle. The addition of the naphtha had two functions. The first was to reduce the viscosity of the solution to increase the rate of settling, and the second was to give an oil-naphtha solution which was lighter than the petroleum; the petroleum being only slightly soluble in naphtha at low temperatures. This method was not applicable to the low viscosity oils, as the paraffin wax would not settle effectively.

The removal of paraffin wax from low viscosity lubricating oils was accomplished in a rather ingenious manner. An ice plant owner, who was interested in the development of refining processes, tried pumping some paraffin distillate, a low viscosity wax bearing oil, through pipes that were completely surrounded with ice. He then spread the chilled oil on the floor and shoveled the snow-like mixture into sacks. These sacks were then piled up and a heavy weight placed on top of them. Oil soon began to ooze out of the sacks, leaving inside a heavy wax. Thus, in a crude manner, the perplexing problem of separating paraffin wax from oil was solved.

The process finally developed back in 1880 consisted of chilling the paraffin distillate and pumping it, under 350 pounds pressure, through a plate and frame, canvas leaved, filter press. The process was generally carried out in two steps, in series—first, at about 50° F. and then at about 20° F. The wax remaining in the press is further refined for refined paraffin wax. The oil has a pour of about 27° F. In some cases, for the production of 0° F. pour oil, the stock is pressed at a lower temperature.

The process described above is still in use on practically all paraffin distillates. The equipment, of course, has been improved since the original development, but the general operation has remained practically unchanged. During the last few years, processes have been developed which will handle both the paraffin wax and amorphous wax bearing oils. It is probable that these processes will eventually completely replace the old standby. These processes will be described later on.

Removing Amorphous Wax

In the development of methods for removing amorphous wax from high viscosity oils, the original process involved blowing cold air across a shallow pan containing the solution of naphtha and oil to be processed. This soon led to the more efficient method of placing the solution in a large tank equipped with brine coils. The stock was slowly cooled down to the desired temperature and allowed to settle. A clear solution collected on the top, a relatively oil-free petrolatum on the bottom and a thin layer of unsettled stock floated between the two. This stock was reheated and reprocessed. The petrolatum produced is usually refined and sold as a petroleum jelly for use as petrolatum, ointment base, greases, cable insulator, etc.

About 10 years ago, it was found that better yield of dewaxed oil and lower plant and operating costs could be obtained by centrifuging the chilled stock. This process rapidly displaced the older cold settling method, and today there are relatively few cold settling plants in operation. Each centrifuge will normally produce about 30 bbls. daily of dewaxed oil. The yield of petroleum may vary between 2 per cent for low pour stocks to 20 per cent for high pour paraffin base stocks. Originally in centrifuge plants, the stock was batch chilled in large tanks equipped with agitators. However, recent trends have been toward continuous chilling with the consequent possible recovery of refrigeration by heat exchanging with the cold dewaxed solution.

Lowering Pourpoints

During the past few years, the number of methods of obtaining low pour and cloud points on lubricating oils have increased tremendously. They may be classified as filter-aid dewaxing; the use of Paraflow as a pour inhibitor or centrifuge aid; the use of special solvents with either cold settling, centrifuging or cold pressing.

Filter-aid dewaxing involves the addition of a finely divided porous solid, usually silica, to a chilled solution of feed stock and naphtha, and then filtration through a pressure or vacuum filter at low temperatures. The first plant of this type was installed in 1928. Any type of wax may be removed from any grade of oil with this process.

Paraflow is the Standard Oil Development Co.'s trade name for a specially processed hydrocarbon oil, which is similar in physical properties to a Pennsylvania cylinder stock (a high viscosity oil), but has the peculiar property of inhibiting the pourpoint of oils with which it is blended. As little as 0.5 to 1 per cent will reduce the pourpoint of some oils by 45° F. Accordingly, stocks may be dewaxed to relatively high pours (30 to 35° F.) which cheapens dewaxing costs, and then blended with a small percentage of Paraflow for the production of 0° F. pour oils. Paraflow also aids centrifuging, cold settling and filtration when added in small percentages to feed stocks for these processes. Another peculier feature of this substance is that it permits pumping of stocks below their pourpoints.

The use of special solvents other than naphtha for diluting lubricating oils for wax removal has increased extensively in the past few years. Up to the present time, many of these processes have been carried out on only laboratory or pilot plant scale, but some have been used in commercial plants. In general, the advantages claimed for the use of special solvents are: A lower plant investment; lowering operating costs; higher yields of finished stock; higher allowable wax separating temperatures; higher allowable chilling rates; smaller percentage of solvent dilution; greater flexibility as to quality of stock that can be handled; in some cases, nonflammability of solvent.

Solvent Methods

The majority of these advantages can be attributed to the fact that the special solvents are less viscous than naphtha and will dissolve less wax than naphtha.

The processes that have been or are now being reduced to commercial practice are: The benzol-acetone cold pressing process; the propane-self refrigeration cold pressing or cold settling process; the trichlorethylene-separator-Nobel centrifuging process.

The benzol-acetone system is very similar to the filter-aid dewaxing process, with the exception that no aid is added. A commercial plant was installed in 1927.

The propane process is very unique, in that no outside refrigeration is required, the refrigeration being obtained by vaporizing the propane. A commercial plant of this type was installed in September, 1932.

The trichlorethylene system is similar to the Sharples centrifuging method. The main difference is that the solvent is heavier than the oil and, accordingly, the solvent-aid solution is beavier than the petrolatum and goes to the outside of the centrifuge bowl. In the Sharples centrifuge, the petrolatum goes to the outside of the bowl.

In general, it is significant to note that the past few years have seen drastic improvements in the dewaxing of lubricating oils, a process which has lain practically dormant since the beginning of petroleum refining. Although at the present time these processes seem to give all that could be expected, it is quite probable that, with the present rapid advances in petroleum technology, they may be obsolete within a few years.

Sealed Cans for Motor Oils Call for an Efficient Conveyor System in Refinery

E. E. BOWN, S. M. WOLBERT, F. J. HEALY
Kendall Refining Co.

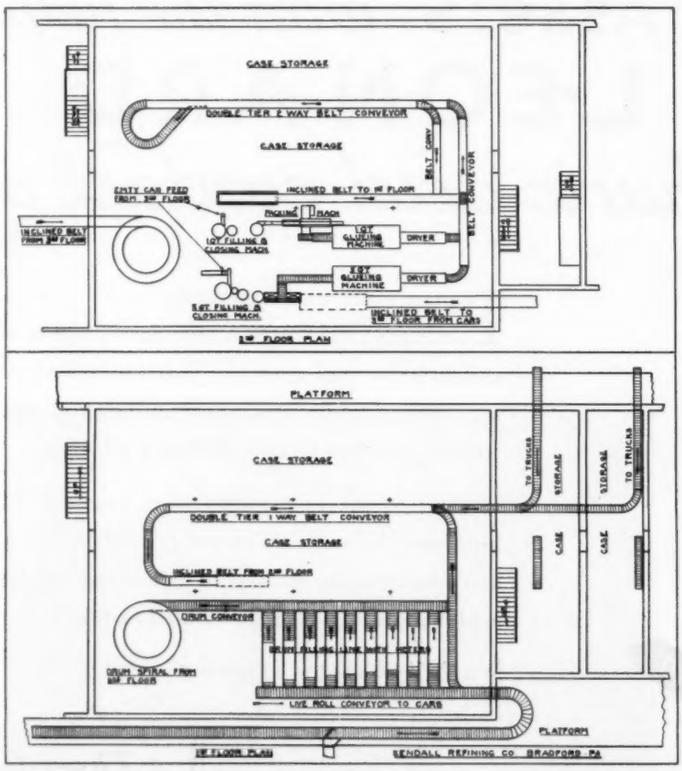
In January, 1933, the necessary equipment for shipment of motor oil in refinery sealed 1-quart and 5-quart cans was placed in operation. This early installation consisted of two closing machines and a 1-quart Sprague Sells filling machine, with the 5-quart cans being filled by a hand-operated machine.

In a short time a 5-quart filling machine, a 1-quart boxer and an automatic carton gluing machine were added, along with a large amount of conveyor equipment.

Empty cans are unloaded from the car and carried on a belt conveyor to the third floor for storage, along with such drums as are needed for sale of oil direct to consumer. Oil for resale is sold only in refinery sealed cans. The empty cans are fed from the third floor to the filling machines on the second floor over the empty can trackage. The one quart can line operates at a speed of 130 cans per minute, passing through the filler to the four station C. R. Continental closing machine, thence to the Standard Knapp boxer, which places 24 cans in the carton. A short gravity conveyor leads to the Standard Knapp automatic gluer, where both top and bottom of the carton is glued.

On the five quart line the cans are filled at the rate of 30 cans per minute, being closed on a PDS Continental closer.

The sealed cartons from both lines are delivered to a common belt conveyor at right angles to the filling lines. In order to avoid interference between the one quart and five quart cartons as discharged onto this belt a novel device was installed, which allows cartons to be discharged alternately from the gluers. Reference to the floor plan will show cartons traveling lengthwise of the room on the upper section of the conveyor from which they are taken to be placed in storage. If cars are being loaded from the floor the outgoing cartons are placed on the under section of this same conveyor, from where they discharge to another belt placed at right angles, which carries them to a decline belt conveyor leading to the first floor and thence to the cars or trucks being loaded.



A second conveyor is about to be installed under the present belt conveyor, running lengthwise of the first floor. This will make it possible to load trucks from the entire first floor storage without interfering with the loading of cars. Two truck loading locations have been provided for greater speed in handling these shipments.

All conveyors for carton handling are driven by geared motors of one-half to 1½ horsepower. The belt speed is 75 feet per minute. A switchboard for the control of all conveyors and machines on the second floor is located at the five quart filling machine, so that the machine operator has ready control of the floor. Starting buttons are also located at each motor for emergency use.

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Kendall Converts Dubbs Cracking Unit to Coking Without Making Major Change in Equipment

By E. E. BOWN, S. M. WOLBERT and F. J. HEALY
Kendall Refining Co.

The No. 3 Dubbs unit (full flashing type) was installed during the fall of 1931, and started operation in December of that year. As installed originally this unit was equipped with one Alcorn Combustion Co. furnace, of the radiant heat type, containing eighty-six 4-inch outside diameter by three-eighths inch wall tubes 30 feet long, arranged in the following manner: Eighteen tubes in the convection section, 30 tubes across the roof, 17 tubes down the back wall, and 21 tubes across the floor; the remainder of the flow through the unit being the same as the conventional single furnace Dubbs full flashing unit.

This unit was installed originally for the cracking of Pennsylvania gas oil with a rated capacity of 1,350 bbls. per day, and was equipped with two 16-foot diameter by 18-foot high Gray towers, for the treatment of the total gasoline produced from all three Dubbs units, as the pressure distillate from units Nos. 1 and 2 was charged into the fractionating column of unit No. 3 for rerunning. These towers have since been eliminated, in favor of Universal Oil Products Co.'s inhibitor, which works very nicely in this particular gasoline.

In the spring of 1933 an additional furnace was added to this unit, along with the necessary equipment for removing a side stream from the fractionating column to serve as charging stock for the second furnace, allowing more flexibility in the operation and making it possible to selectively crack the long range charging stock, which is used in this plant. Straightrun gasoline, naphtha or water white kerosene may also be charged, separately and direct to this second furnace, along with the side stream from the fractionating column.

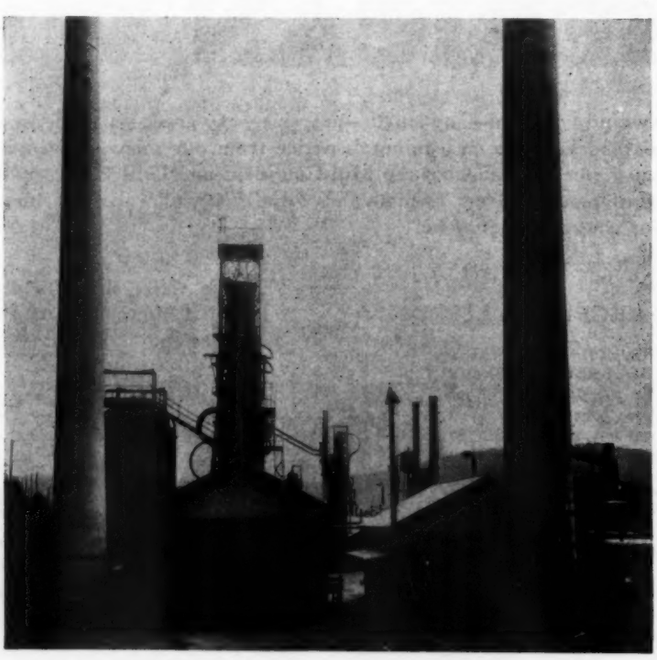
This furnace is an Alcorn combination radiant and convection heat type, being fired from both ends, the convection gases from each firing side passing over the bridge walls in the center of the furnace and downward through the convection tubes on through an air preheater and to the stack. The arrangement, size and number of tubes in this furnace is as follows: Forty-seven 3-inch outside diameter by 2¼-inch inside diameter by 22 feet effective length in the convection section; thirty-five 3-inch outside diameter by 2¼-inch inside diameter by 22 feet effective length in the heating side of the furnace, located across the floor and roof in single rows; fifty-eight 3½-inch outside diameter by 2¾-inch inside diameter by 22 feet effective length tubes in the soaking side of the furnace being located across the floor and roof in double rows, the flow being staggered from upper to lower row in both the floor and roof section. This furnace is equipped with the conventional Alcorn carborundum firing tunnels being located eight on each side of the furnace.

Flow of Oil

The flow through this unit is now as follows: The blended gas oil, petrolatum charging stock, is fed into an absorption tower, countercurrent to the uncondensable gases leaving the unit, and is picked up from the bottom of the absorption tower by a 7½-inch by 4¼-inch by 10-inch Worthington duplex steam pump and charged into the lower part of the fractionating column. From there it is picked up along with the recycle stock being refluxed to the bottom of the column by a Worthington cross compound duplex steam driven plunger type hot oil pump, size 23-inch by 32-inch by 4½-inch by 21-inch, and charged direct to the let temperature to this furnace is approximately 600° F., depending on the type of operation. The transfer line temperature leaving this furnace and discharging into the top of the reaction chamber is approximately 900° F. at a pressure of approximately 500 pounds. The side stream from the fractionating column is accumulated in a stripping column, and picked up from there by a National Transit duplex plunger type hot oil pump, size 3½-inch by 12-inch, driven by a 14-inch by 10-inch Troy vertical steam engine. Much flexibility is obtained in the operation of this pump due to the reduction gear drive. From this pump the side cut is discharged to a Leach heat exchanger in combination with any gasoline, naphtha or water white kerosene charging stock, which is fed into the side cut pump discharge line by a Worthington duplex steam pump, size 14-inch by 3⅝-inch by 12-inch.

The temperature of the combined charge entering this heat exchanger is approximately 480° F., and leaves at approximately 680° F. and then enters the convection section of the light oil furnace. From this convection section the oil flows into the floor tubes of the heating section of the furnace and thence to the roof tubes. The temperature of this material leaving the heating side of the furnace and entering the roof tubes of the soaking section may be varied to almost any temperature to suit the charging stock being fed into the furnace; from the roof tubes of the soaking side of the furnace the oil flows into the floor tubes and then out through the transfer line into the top portion of the reaction chamber. The oil temperature at this point may be varied up to 1,025° F. and an outlet pressure of 700 pounds, depending again upon the type of charging stock being processed.

The combined materials from both furnaces pass downward through the reaction chamber, where a temperature of approximately 875° F. and a pressure of 450 pounds is maintained, and passing out of the bottom of the reaction chamber through a deFlorez remote control valve, by means of which the reaction chamber pressure is held, and into the lower part of the flash chamber. A cooling medium is used in the transfer line between the reaction chamber and the flash chamber, which gives control of the temperature entering the flash chamber. The residue is separated in the flash chamber, being drawn out of the bottom, either to storage tanks to be used as refinery fuel or sold as the market dictates, or to the coking system (which will be explained later). The vapors from the flash chamber pass through the aforementioned Leach heat exchanger, giving up some of its heat, into the charging stock to the light oil furnace, and then pass on into the fractionating chamber. The gasoline vapors leaving the top of the fractionating column are cooled in a box type parallel coil condenser, and the gasoline accumulated in a distillate receiver where the uncondensable gases are released by means of a Foxboro pressure controller, which maintains a pressure of 70 to 80 pounds on the low pressure side of the unit, the 80 pounds being held on the flash chamber. The gasoline is discharged from the receiver into a surge tank, and picked up from there by a 12-inch by 6-inch by 12-inch Dean Brothers close clearance simplex steam pump and discharged into the stabilization tower, where it is finished to a suitable vapor pressure for the gasoline market. A unique feature of this stabilizing plant is the reflux ratio controller which controls the rate of reflux in proportion to the rate of feed to the column, leaving only the kettle temperature, or column pressure, to be varied in order to maintain the finished gasoline vapor pressure. The heating medium used in the stabilization of the gasoline is taken from the bottom of the fractionating column of the cracking unit and recirculated back to the fractionating column. After being stabilized the gasoline is treated with Universal inhibitor and passed on to storage. As a result of adding the second furnace the capacity of the unit was increased to 2,350 bbls. per day, in addition to giving the desired flexibility.



General view of Dubbs unit converted to coking at the Kendall Refining Co. plant at Bradford, Pa.

Change to Coking

During January and February of this year one of the Gray towers, the use of which was discontinued as before mentioned, was converted into a coking chamber. The operation of this phase of the cracking system is as follows:

The residue as produced from the flash chamber is discharged into the top of the coking vessel at approximately 750° F. temperature and 30 pounds pressure. A heating medium (in this case material from the transfer line of the light oil furnace) is introduced into the bottom of the coking vessel supplying the additional heat necessary to flash the residue down to coke. The vapors leaving the top of the coking vessel are maintained at a suitable temperature and passed on into a knockout tower, from the bottom of which the heavy ends condensed in the tower are withdrawn and recirculated back to the flash chamber. The overhead vapors from the knockout tower are condensed in a box type parallel coil condenser and accumulated in a distillate receiver from which this distillate is pumped into the fractionating column of the cracking unit to serve as charging stock. All gas formed in the coking operation is passed through the aforementioned absorption column, which is maintained at approximately 20 pounds pressure, and any recoverable material in this gas is absorbed by the heavy charging stock to the cracking unit.

The coking vessel is equipped with a 48-inch manhole in the bottom to facilitate the removal of the coke and approximately 6,500 feet of three-quarters inch wire cable is suspended in the chamber for this same purpose. The coke as produced in this system is of a very porous nature but is very low in volatile matter, making it a readily marketable product.

As in the case of all nonresidue operations, the capacity of the cracking unit is somewhat reduced as compared to the capacity when producing residuum, but the gas yield is increased substantially over the residuum type of operation, and due to the fact that the type of operation of the unit can be changed at will to suit the market requirements, we believe that this addition makes this unit the most modern and flexible unit in the industry.

GASOLINE FROM COAL

MONTREAL, Quebec, Mar. 26.—Developments in the extraction of oil from coal have progressed to such an extent that benzoline is popularly supported by the British motoring public, according to Colin Wemyss, British manufacturer, who is visiting Canada and the United States.

"Although the price of benzoline approximates that of the best gasoline, it is hoped that large contracts will be placed with the producers by the British Admiralty for the use of the Royal Navy. In that event, the development of the industry, which could, in time, make Britain independent of foreign interests, would be more or less assured," he said.

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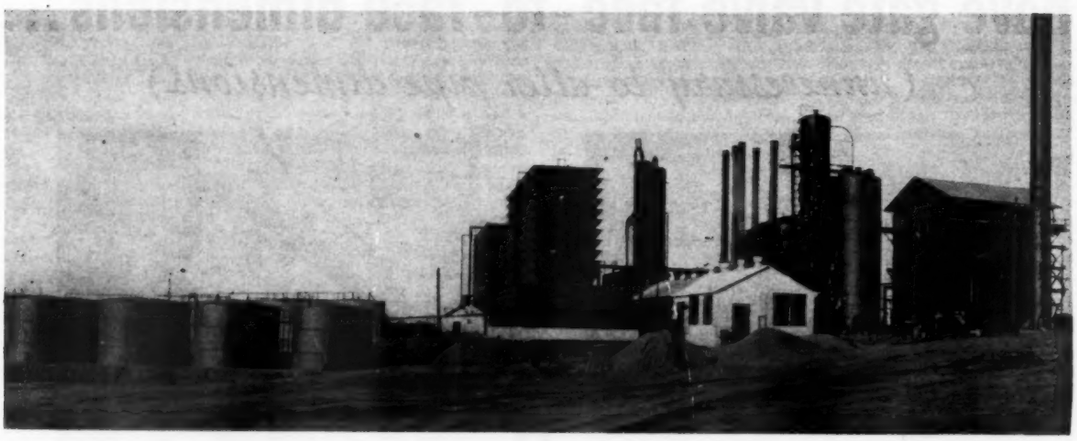
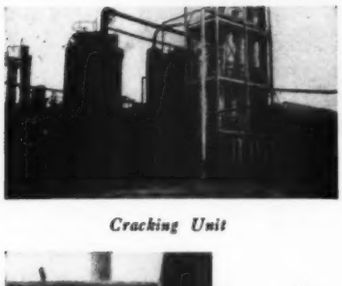
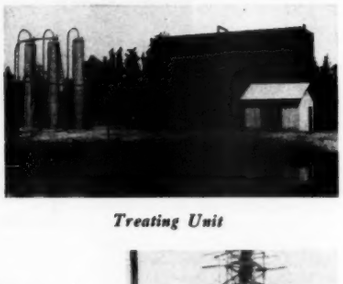


Combination Topping and Cracking

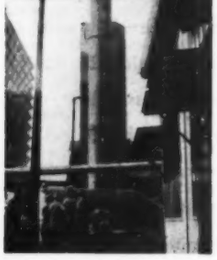


Cracking Unit

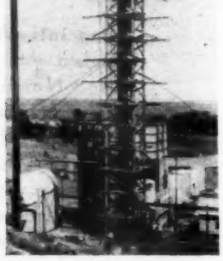


Treating Unit

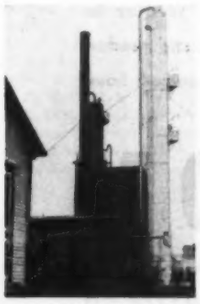
Refineries throughout the Southwest are getting excellent results from Ampco refining units. Ampco refining units incorporate the combined experiences of the purchaser and the Ampco organization. They reflect such features as are dictated by the refiner's operating experience and demands.



Vapor Recovery Plant



Topping Unit



Topping and Cracking Unit

Topping Unit

Topping - Cracking - and Vacuum Units

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DALLAS, TEXAS

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East Texas Refining Industry Given Recognition and Is Now Building Plants for Permanency

The oil refining industry in East Texas grew to an important place while that branch of the oil business was in a state of inactivity in the rest of the country. It now includes a daily refining capacity of 140,000 bbls., comprises 60 plants and is running approximately 80,000 bbls. of crude daily.

Because of the haste with which the East Texas Field was developed from a producing standpoint and because of the rapidity with which refineries were built, some contend it will only be a matter of time before East Texas ceases to be an important refining center. This view does not seem to bear close analysis, however, because permanent improvements are being made in a large enough number of the plants, indicating that the owners choose to remain there, and further than this the area has certain natural advantages over many of the othre existing refining centers.

The refining industry in East Texas had its beginning late in January, 1931. An announcement was made that four refineries would be built in the field. These included the East Texas Refining Co. which was to build two 6,000-bbl. skimming units, one at Henderson and one at Longview; the Taylor Refining Co. which was to build an 8,000-bbl. skimming plant at Tyler, and the Beacon Oil Refining Co. which was to build a 2,000-bbl. skimming plant at Henderson.

Tracing the development of the East Texas refining industry from that time, we note that just three years ago, in March, 1931, it was credited with having under construction plants which were to have a refining capacity of 22,000 bbls. In that month, announcement was made of plans for the building of 10 more plants immediately.

First Gasoline in 1931

The first gasoline was turned out in May, 1931.

In March, 1932, or just two years ago, the field was credited with having 19 refineries operating with a total refining capacity of 79,800 bbls. daily and crude runs were approximately 14,000 bbls.

One year later, March, 1933, a total of 34 refineries was shown, having a daily capacity of 86,850 bbls. and running approximately 34,000 bbls. of crude.

At present, there are 60 refineries in the field. These have a capacity of 140,000 bbls. daily and actual runs are in excess of 80,000 bbls.

Many plants which were built early in the field's development have undergone major changes, most noticeable of which has been the addition of cracking units. It is believed that over the next two years many more cracking units will be added and the tendency will be toward consolidation of refining companies.

Refineries in East Texas Field

Gladewater Area

Name of company—	Capacity (bbls.)
Carnation Ref. Corp.	1,000
Chief Ref. Co.	1,500
Duckworth & Chandler Ref.	500
Dutch Rose Ref. Co.	750
Foshee Ref. Co.	1,500
Gladetex Ref. Co.	1,000
Gilliland Ref. Co.	1,500
Godlin Ref. Co.	850
Goodson-Gentry Ref. Co.	1,200
Hawk Ref. Co.	800
Keystone Ref. Co.	1,000
Lake Ref. Co.	1,700
Lindsey Ref. Co.	2,500
Locke Ref. Co. No. 1	1,500
Locke Ref. Co. No. 2	1,500
Lotus Ref. Co.	1,500
Supreme Ref. Co.	1,000
Texas Oil Products Co.	2,000
Upshur Ref. Co.	1,000
Wichita Ref. Co.	500
Total	24,800

Overton Area

Arrow Ref. & Producing Co.	4,500
Oil Refineries, Inc.	4,000
Overton Ref. Co.	3,500
Rusk Oil & Ref. Co.	3,000
Solar Ref. Co.	3,000
Total	18,000

Longview Area

Danciger Refineries, Inc.*	10,000
East Texas Ref. Co.	10,000
Total	20,000

*Shut down.

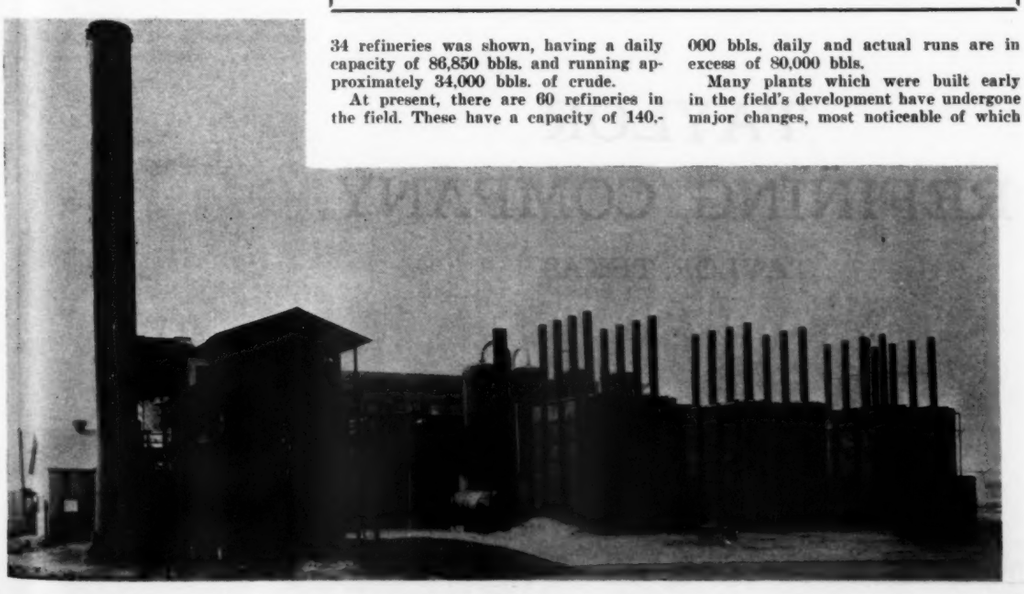
Scattered Plants

Name of company—	Capacity (bbls.)
Arpana Ref. Co., Arp	4,000
Beacon Oil & Ref. Co., Henderson	4,500
Century Ref. Co., Friars Switch	2,000
Gilmer Ref. Co., Gilmer*	500
Henderson Ref. Co., Henderson*	12,000
Owl Ref. Co., Arp	1,500
Pine Ref. Co., Camps Switch	2,500
Recla Ref. Co., Turnerstown*	200
Sinclair Ref., Camps Switch	5,000
Southern Ref., Reeds Switch	2,500
Taylor Ref. Co., Tyler	15,000
Trico Ref., Turnerstown*	200
Trio Ref. Co., Arp	1,000
Tyler Ref. Co., Arp	2,000
Union Ref., Camps Switch.	3,000
Total	55,900

Kilgore Area

Canyon Ref. Co.	800
E. & F. Ref. Co.	200
East Tex. Refined Products	700
Hix-Keller Ref. Co.	1,000
Johnson Ref. Co.	1,000
Kilgore Ref. Co.	3,000
LaPren Ref. Co.	1,500
O. K. Ref. Co.*	1,000
Owl Ref. Co.	1,800
Panama Ref. Co.	1,500
Pennant Ref. Co.	1,000
Roco Ref. Co.	1,200
Southport Ref. Co.	2,500
Texas Ref. Co., No. 1	1,000
Trinity Ref. Co.	2,000
Unit Ref. Co.	200
Utah Ref. Co.	200
Hanover Ref. Co.	800
Total	20,400

*Shut down.



Taylor Refining Co.'s plant near Tyler, one of the first plants to be built in the East Texas field

Natural Advantages

Pending what promises to be something close to government control of refinery operations throughout the country, it is difficult to predict what to expect in East Texas further than to say a slowing up of building new plants will probably occur, along with the addition of cracking units in many of the existing plants.

East Texas refiners enjoy having at their back door a source of crude oil far in excess of present needs and likely to be adequate for many years in the future. It can be produced at a low cost, it can be processed cheaply and the products are fully up to the average in quality. The straightrun gasoline has a higher antiknock value than that produced from the average Mid-Continent crude, and about the only handicap refiners have met in processing the crude is that the cold test on the residuum is relatively high. The addition of cracking units will, of course, eliminate this problem.

Crude Supply Adequate

Being protected by an adequate crude supply over the future, having no unusual operating conditions, the problem of the East Texas refiner resolves itself into one of marketing his material. Thus far the East Texas refiner has had to force his way into an already crowded market. He was able to do this at the expense of the refiners in other areas because his average cost of crude has been below that of outside refiners. As time goes on, his average crude cost will probably come up to something like that of the average in the Mid-Continent. His attention will then be turned toward reducing operating costs and delivery costs.

Some consideration has been given to the building of a gasoline pipe line to the Gulf Coast, and a co-operative arrangement would permit East Texas refiners to be in a very favorable position to expand their markets in this manner. The East Texas Field is considered as an inland field. Actually it is closer to the Gulf Coast than it is to Austin, the capital of Texas.

Hot Oil

The East Texas refiner has been accused of running hot oil and if by hot is meant, oil selling below the posted field price, not many of them would claim a perfect record since proration was instituted in that field. However, this condition was not one of the refiners making alone but was largely the result of producers forcing more oil onto the market than it could normally absorb. Refiners in East Texas as a group would welcome a solid crude market as well as refiners in all other areas for they know that they would receive more for their products in return.

Conditions are shaping themselves to where this will obtain. Over the past two years the action of the state and Federal courts in Texas from time to time has aided and then retarded progress in stabilizing prices, but each day that oil is taken from the East Texas Field the potential recovery is lessened by that amount and sooner or later natural forces will come into action that will permit the East Texas refining industry to feel secure in the matter of prices it is to receive for its products and will enjoy recognition as a logical and permanent part of the oil business.

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Pennzoil Uses Miniature Equipment for Accurate Laboratory Control in Refinery Operations

By P. M. ROBINSON
Research Engineer, The Pennzoil Co.

The refiner, who wishes to keep pace with modern developments in the manufacture of motor fuels and lubricants, must have at his disposal miniature equipment with which he is able to determine quickly the efficiency of operation of large scale apparatus. The miniature plant must produce data from which operating conditions of commercial plants may be predicted. It must check the quality of products, after these operating conditions are effective to assure that the equipment is operating in the most efficient manner. It must make complete analysis of crude products being charged to any unit, so that technicians may carry on research for new products. All of these things must be done in the shortest possible time and yet the products from the miniature plant must be of sufficient volume for complete physical inspection.

Such an apparatus, as has been described, is the laboratory standard vacuum column. The Pennzoil Co. has utilized one of these columns for the last three years and has found it an almost indispensable auxiliary in the efficient operation of a modern refinery, and in continued research for new products.

Description of Column

The laboratory standard column, Figure 1, consists of a five liter balloon flask, A, to which is welded a glass column, B, 2 inches in diameter and 48 inches in length. Glass jacket, C, is placed around the column to serve as a static air jacket. Another jacket, D, surrounds the whole equipment. An inlet for hot air is provided at the bottom of B. D is wrapped with coils of resistance wire which serves to control the temperature of the ascending air in the outer jacket. With this air jacket arrangement, adiabatic conditions are maintained within the fractionating column. The column, B, is packed with iron Lessing rings which are made by bending strips of sheet iron in a circular shape with the inner end of the strip extended across a diameter of the circle. These rings are one-half inch in length and one-half inch in width. A reflux head, E, is attached to the top of the column into which is blown hot or cold air depending upon the amount of reflux required. A side arm connects this head to a condenser, F, to which is connected flask, G, which serves as a capacity flask for changing graduates, and graduate, H, for collecting product. The complete apparatus is constructed of Pyrex glass.

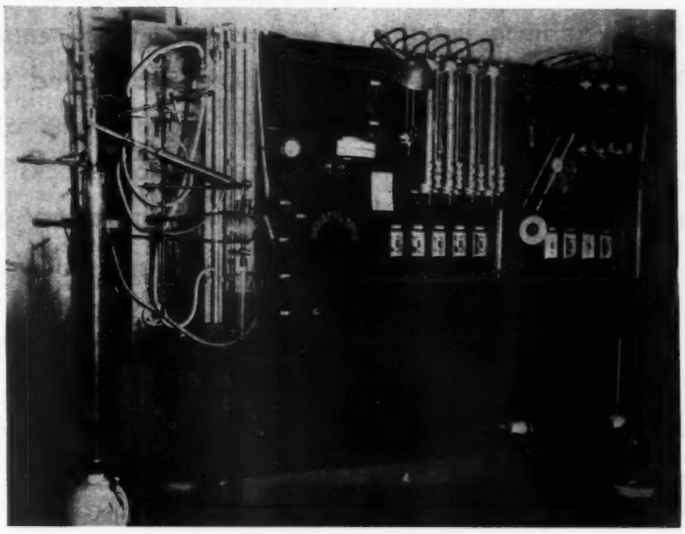

Fig. 3—General view of laboratory control apparatus

A heating element for the flask is made by filling a suitable receptacle with a semiplastic mortar of high temperature cement, hollowing out a space into which the flask will sit snugly, and then pressing coils of resistance wire into the wet cement. When the cement has hardened, the excess cement is removed from between the coils of wire. Heaters are made for the air blown in at the bottom of jacket, D, by increasing a coil of resistance wire in an asbestos paper wrapping and introducing into an iron pipe. The pipe is also insulated on the outside with asbestos. A similar heater is made for heating reflux air.

Thermocouples are placed in the liquid in the flask, vapor leaving the column, air entering jacket, D, air leaving jacket, D, and air entering the reflux head. Leads from these couples are brought to an indicating potentiometer mounted on the control board. A selective rotary switch allows the instrument to indicate any of these temperatures desired.

The most suitable connections where temperatures are high, are the best grade of corks covered with red glyptol lacquer. The best connections where temperatures are low, are rubber stoppers covered with this same product. Glyptol lacquer is obtained from General Electric Co., Buffalo, N. Y.

Vacuum is maintained on the apparatus by a Cinco Mega-Vac pump. Air is furnished by a small rotary fan.

The additional equipment, consisting of rheostats for controlling the current to all heating elements, barometer, manometer for indicating absolute pressures in different parts of the system, switches, ammeters, vacuum controls and control valves are all mounted on the control board and are under the direct supervision of the operator at all times.

Operation of Column

Operation of the column is practically automatic, the operator having only to record the different temperatures and pressures, change receivers, and manipulate the rheostats for proper distillation rate, reflux rate and control of air temperatures. The amount of charge to the flask will, of course, depend upon the type of data desired and the cuts requiring physical inspection. A crude analysis, being the most involved likely to be encountered, will be described. The 3,000 cc. of crude corrected for volume to 60° F. is charged to the flask. For removing gasoline and naphtha, the column is operated under atmospheric pressure. Heat is applied to the flask until the vapor thermocouple indicates that distillation has started. Cold air is blown in the reflux head. If the air is not sufficiently low in temperature to condense the proper amount of reflux, ice water is placed in the jacket or at times carbon dioxide snow and acetone. The column is operated just below the point of flooding. Air blown in the bottom of the jacket is controlled at the same temperature as the liquid boiling in the flask. Air leaving the jacket is controlled at the same temperature as the vapors leaving the column. For lighter products, such as gasoline, a second receiver set in a thermos bottle packed with carbon dioxide snow is connected to the receiving graduate for condensing lighter products. When the vapor temperature reaches 380° F., the receiver is changed. The volume of product collected is corrected to 60° F. and reported as gasoline. This gasoline will have an endpoint of 380° F. by an Engler distillation. Curiously, this

(Continued on Page 114)

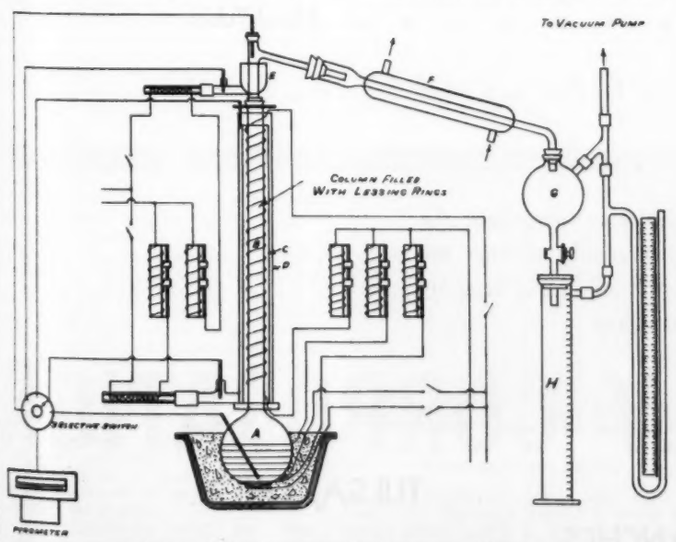

Fig. 1—Laboratory standard vacuum column

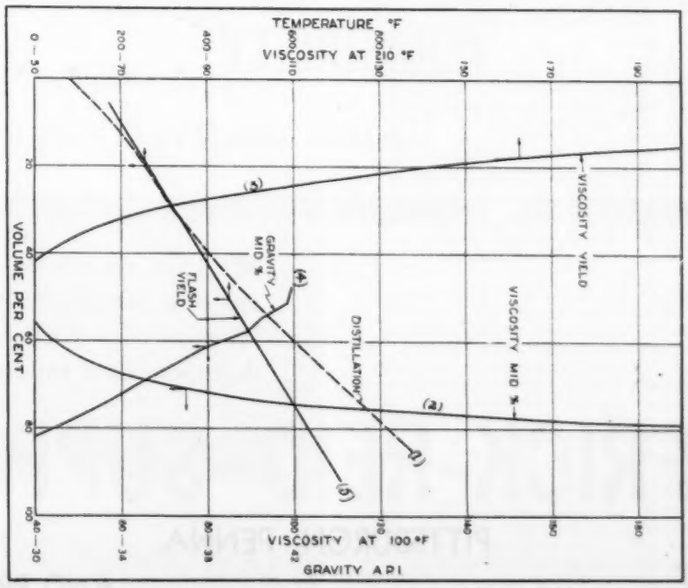

Fig. 2—Standard column analysis of Bradford crude

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Availability of Higher Antiknock Motor Fuels Is Influencing Commercial Car Engine Design

By H. H. DEDO and EARL BARTHOLOMEW
Ethyl Gasoline Corp.

It is doubtful whether anything created by man at any time during his existence has been the subject of such intensive research or has undergone such revolutionary changes in so short a period as have the modern passenger automobile and those things essential for its operation. In less than seven years we have seen the engine ratings of the low-price cars increased from a range of 20 to 30 horsepower up to an average between 80 and 90 horsepower, along with comparable advances in roads and fuels. No less remarkable have been the mental phenomena which have manifested themselves in the general acceptance of the improved

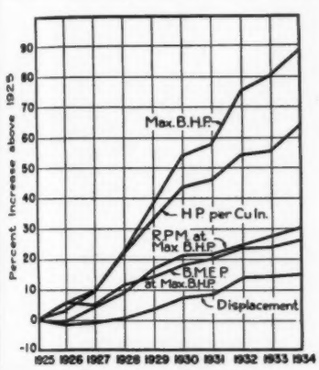

Percent Increase above 1925
Max B.H.P.
H P per Cu In.
R P M at Max B.H.P.
B M E P at Max B.H.P.
Displacement
1925 1926 1927 1928 1929 1930 1931 1932 1933 1934

Fig. 1—Trends of American passenger car engine design since 1925. Average values for all American cars listed in trade publications

ability of automobiles as a modern necessity and by the dexterity and confidence with which the average motorist uses the power placed at his command.

Figure 1 shows graphically the average percentage increase in maximum horsepower of American passenger cars each year since 1925, along with the changes in engine design, expressed in per cent, which have produced the increased power. Greater power may be obtained by one or more of three methods, viz.: greater engine displacement, higher engine speed or improved brake mean effective pressure. The power output per cubic inch of displacement depends entirely on engine speed and brake mean effective pressure. The average increase in horsepower since 1925 has been 88 per cent, of which increase 42 per cent has been contributed by increased engine speed, 20.7 per cent by greater displacement and 37.3 per cent by improved brake mean effective pressure. The latter, which is a direct measure of thermal efficiency, has been brought about by improved volumetric efficiency and higher compression ratios made possible by the availability of fuels of higher antiknock value.

Figure 2 is a chart similar to Figure 1 except for bus and truck engines for the period from 1927 to 1934. The average increase in horsepower has been 46 per cent, of which increase 62.5 per cent has been contributed by increased engine speed, 11.2 per cent by greater displacement and 26.3 per cent by improved brake mean effective pressure.

Two differences between trends in engine design for passenger and commercial vehicles are apparent:

1. The power of commercial engines has not increased as rapidly as that of passenger car engines.

2. The increases which have been made have resulted to a much smaller degree from improvements in thermal efficiency.

Use of Commercial Cars

Commercial vehicles and their use at the present time present an interesting picture. Some of the finest examples of automotive engineering achievement are to be found in this field, but as a whole there has not been a progressive development comparable to that in the passenger car industry, for perhaps the following reasons:

1. The commercial vehicle assumed later an indispensable part in our economic life and only recently attempted to compete with the railroads.

2. The smaller production and greater unit cost have tended to hamper research.

3. The large cylinder size has created valve, spark plug and piston problems not until recently approached by the passenger car engine.

4. In some cases the production of commercial vehicles has been closely associated with the manufacture of farm

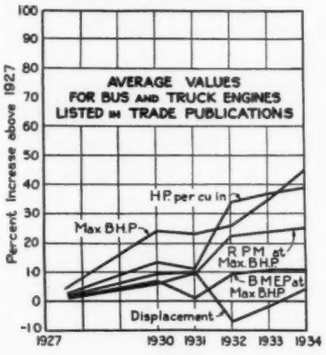

Percent Increase above 1927
AVERAGE VALUES FOR BUS AND TRUCK ENGINES LISTED IN TRADE PUBLICATIONS
H.P. per cu in.
Max B.H.P.
R P M at Max B.H.P.
B M E P at Max B.H.P.
Displacement
1927 1930 1931 1932 1933 1934
Year

Fig. 2—The trends of American commercial vehicle engine design since 1927

and industrial machinery whose design has remained practically stationary.

Figure 3 shows an 80-horsepower engine from a low-price 1934 car and a 3-horsepower stationary farm engine to burn kerosene. The economy of material and space that has been effected in the design of the car engine is readily apparent. Unfortunately, some commercial car engines are still loosely shackled to their primeval ancestors, the stationary engines designed to burn low-grade fuels, notwithstanding the fact that they must be used for entirely different purposes. Further development of such bus and truck engines requires a complete break with the past—a recognition of the fact that the criterion for economy is not the cost of a gallon of fuel but the useful energy which it can be made to deliver per dollar of cost.

Growth of Trucks and Buses

Trucks and buses have rapidly risen in importance to a point where they now constitute an integral part of our transportation system. Competition is speeding up the running schedules and operating economy requires the maximum ratio of pay to gross load. Progressive commercial vehicles are alert to the economic possibilities of the high-grade antiknock fuels now made available by refiners. Figures 4, 5 and 6 show the gains in power and fuel economy in three different makes of large commercial engines made possible through the use of the improved gasolines in conjunction with higher compression ratios.

It will be noted that in Figure 4 an increase in compression of 0.87 ratio increases the maximum output from 152.5 to 175 horsepower, or 12.8 per cent, with a corresponding increase in economy. When operating at a compression ratio of 5.27 the engine produces as much power at 1,700 r.p.m. as at 2,300 r.p.m. when operating at 4.40 compression ratio. If the rear axle ratio is changed proportionally, the improvement in fuel economy is about 17 per cent and engine wear and oil consumption are reduced. The average gains for the other two engines, due to the use of the better fuels, are approximately the same.

It should be noted that these gains are measured at the engine. Because of chassis friction, which does not change materially with compression ratio, the gains in power and economy measured at the rear wheels are greater than those stated above. Furthermore, the operator of commercial vehicles is interested in the economy of hauling pay loads. If the weight of the vehicle is 0.5 of the combined weight of vehicle and load, an increase of 12 per cent in engine power through an increase in compression ratio increases by 24 per cent the weight of the pay load that can be carried at the same speed without an increase in gasoline consumption or of labor or overhead charges. Fewer vehicles and men are required to haul a given load and the cost per ton-mile of pay load is reduced out of all proportion to the gains registered at the engine.

In the case of a bus, the increased power permits higher vehicle speeds, especially on grades, as well as reduced gear shifting, better operating schedules and increased gasoline mileage. Labor and overhead costs are reduced as in the case of trucks.

In Figure 7 is shown a curve (No. 1) of the power required to propel up a certain grade a vehicle equipped with an engine whose power characteristics are shown in Figure 5. Also shown in Figure 7 are curves (Nos. 2 and 3) of the horsepower available at the rear wheels for first and second gear operation with the low compression engine and a similar curve (No. 4) for second gear operation with the high compression engine.

Figure 8 shows curves (Nos. 1 and 2) of engine horsepower at constant speed for the low and high compression engines and curves (Nos. 3 and 4) of the corresponding specific fuel consumption.

It will be observed in Figure 7 that

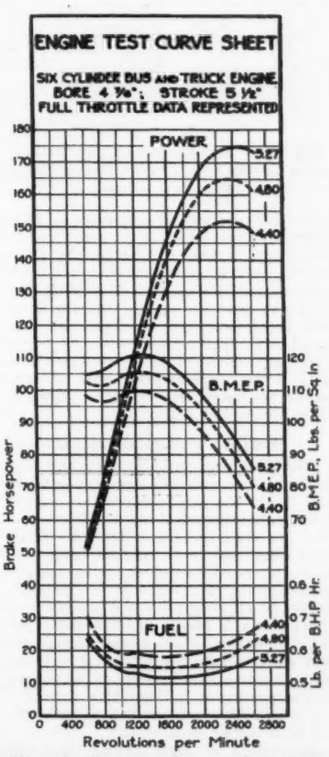
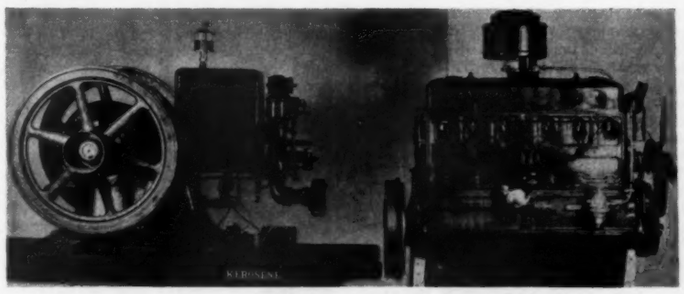


Fig. 4—Comparative performance of a commercial engine at three compression ratios



Farm kerosene engine *Car engine using gasoline*

Fig. 3—Showing relative size of present passenger car and stationary farm engines. The farm engine is rated at 3 h. p., weighs 80 lbs. per h. p. and costs $35.00 per h. p. The car engine is rated at 80 h. p., weighs 7 lbs. per h. p. and costs $2.25 per h. p.

the power required to propel the vehicle up the grade, as indicated on Curve No. 1, is slightly greater than the power of the low-compression engine available in second gear, as shown on Curve No. 3. Under such conditions it is necessary that a shift be made into first gear whose power characteristics are shown on Curve No. 2. The vehicle accelerates to 7 miles per hour, at which an engine speed is attained which brings the governor into operation and the throttle closes sufficiently to reduce the horsepower developed from 124 as shown at B down to 71 as shown at A. The vehicle continues at 7 miles per hour up the grade, operating at 57.3 per cent of full-throttle power, with a fuel consump-

tion rate of 0.76 pound per horsepower-hour as shown at A' on Curve No. 3 of Figure 8.

A similar analysis for the high-compression engine indicates, of course, no change in the power required to propel the vehicle up the grade at a given speed. Curve 4 of Figure 7 shows that the high-compression engine produces sufficient power in second gear to negotiate the

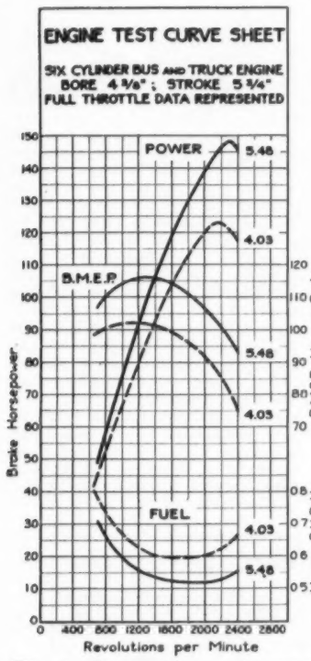


Fig. 5—Comparative performance of a commercial engine at two compression ratios

grade and the vehicle acclerates to 14.12 miles per hour, which is the highest speed attainable in second gear on the grade by the vehicle equipped with the high-compression engine and is slightly less than the governer speed. At this speed 145 horsepower are developed, as indicated at C. The vehicle continues up the grade at a speed of 14.12 miles per hour with a fuel consumption rate of 0.53 pound per horsepower-hour, as shown at C' on Curve 4 of Figure 8.

Relative Fuel Consumption

The fuel consumption with the low-compression engine is 7.8 pounds per mile and with the high-compression engine 5.44 pounds per mile, or a reduction of 30.1 per cent for the latter, the difference being due to the higher cyclic efficiency of the high-compression engine and to its ability to operate at full throttle, under which conditions the specific fuel consumption is less than at partial throttle. The extent to which such large economy gains influence the over-all fuel consumption of a vehicle depends, of course, on the portion of its operating time during which high compression permits the use of a higher gear.

In regions of high altitude the performance of vehicles is severely reduced by air rarefaction and the use of the maximum compression ratio permitted by high antiknock fuels may obviate the necessity of a change in rear axle ratio with the resulting decrease in economy.

Many of the higher compression engines whose characteristics are shown in Figures 4 to 6 are being sold, certain manufacturers having recently increased the compression ratio of their entire lines to take advantage of the higher grade fuels. Competition will eventually force others to adopt the same procedure.

In order that operators who have equipment purchased before the high-compression engines were available may take full advantage of the improved fuels, several of the most important commercial vehicle manufacturers are offering through their service departments replacement pistons and cylinder heads of higher compression ratios which can be installed without additional cost at the time of overhaul.

The high-compression engines now being offered by manufacturers do not in any sense of the word represent the ultimate possibilities in the utilization of high antiknock fuels. Many engineering departments are extensively investigating the problem and preliminary data indicate further potential gains in both power and economy.

Figure 9 shows the relation for one engine of brake mean effective pressure, compression ratio, spark advance and knocking tendency at one speed and wide-open throttle. It will be noted that for a fuel of a given octane number there is a combination of compression ratio and spark advance which produces the maximum brake mean effective pressure and that the spark advance is retarded from the maximum power setting determined for the same compression ratio when a non-knocking fuel was used. At other speeds and compression ratios different relations between brake mean effective

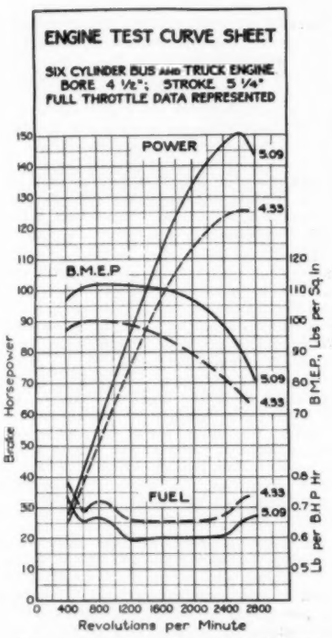


Fig. 6—Comparative performance of a commercial engine at two compression ratios

pressure and spark advance, determined on the same fuel, would exist. The problem, therefore, becomes one of determining for a range of speed and throttle opening the combination of the above-mentioned variables which will produce the highest brake mean effective pressure.

The compression ratio of a given engine can not be changed during operation and the ratio that should be used is determined by the knocking tendency of the engine at the speed at which knocking is most pronounced. If maximum average economy over a wide range of operating conditions is desired, a compression ratio should be chosen which, under the conditions stated in the preceding sentence, requires the retardation of ignition timing below the best power setting for the elimination of knock on the fuel under consideration, but in no case should such a high ratio be chosen that the power developed is less than at the highest compression ratio which permits maximum spark advance on the same fuel without knock. The latter is represented in Figure 9 by point A and the former by point B. At any compression ratio between these two points the thermal efficiency is higher than at A and the heat dissipation problem correspondingly less.

Effect of Speed

At other speeds at wide-open throttle and at all speeds at partial throttle the knocking tendency will be less and the spark may be advanced as far toward the maximum power setting as knocking will permit. The actual maximum power setting can be used over a wide range of conditions, particularly at partial throttle. Under such conditions full advantage is taken of the increased compression ratio. The adjustment of ignition timing required for the operation described above can be obtained by the careful design of a distributor mechanism actuated by changes in engine speed and intake manifold vacuum. The proper characteristics must be worked out by careful dynamometer tests. Gains in fuel economy in excess of 25 per cent, over that obtainable on the same fuel through the use of the maximum power spark advance at wide-open throttle over the entire speed range, have been rported as a result of preliminary tests.

The increased demands that are being made on commercial engines are subjecting exhaust valves and spark plugs to more severe punishment but fortunately the valve and spark plug engineers, by means of continuous research, have been able to meet the problem so successfully that service of these parts now is possible far in excess of that which formerly could be had in the lower duty engines.

The greater potential power of commercial engines is not being held in reserve by operators but is being used to the limit, causing higher temperatures of all engine parts. In the past it has been the practice of engineers to recommend a

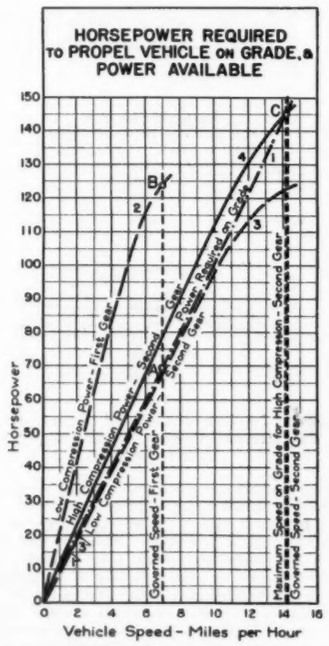

HORSEPOWER REQUIRED TO PROPEL VEHICLE ON GRADE, & POWER AVAILABLE
Horsepower
Vehicle Speed - Miles per Hour
Low Compression Power - First Gear
High Compression Power - First Gear
Low Compression Power - Second Gear
High Compression Power - Second Gear
Power Required on Grade
Governed Speed - First Gear
Governed Speed - Second Gear
Maximum Speed on Grade for High Compression - Second Gear
Governed Speed - Second Gear

Fig. 7—Typical power curves of commercial vehicle powered by engine of Fig. 5

single spark plug for a given dual-ignition engine. The higher engine temperatures now prevailing have shown the desirability of using two different plugs in each cylinder, one type near the intake and a cooler type near the exhaust valve. For example, in one large commercial engine a combination of an AC Type D-4½ plug opposite the exhaust valve and a Type D-8 opposite the intake valve has given 40,000 miles of satisfactory operation in buses running on hard schedules through mountainous country. The present year will witness the introduction of plugs that will set entirely new standards of ceramic resistance and gas-tight construction.

A few years ago the No. 1 Silicrome exhaust valve gave promise of being satisfactory almost indefinitely but the increased power output of engines has caused it to stretch and burn and it is rapidly being replaced by valves made of improved materials, principally the austenitic steels. Examples of these are Rich 143-W and A. E. S. steels. Other valve manufacturers have or will shortly have similar valves available under different trade names. These austenitic valves, when faced with stellite, are even more durable.

Fuels for buses and trucks are accounting for an increasingly greater percentage of total gasoline sales. Approximately 15 per cent of all cars produced

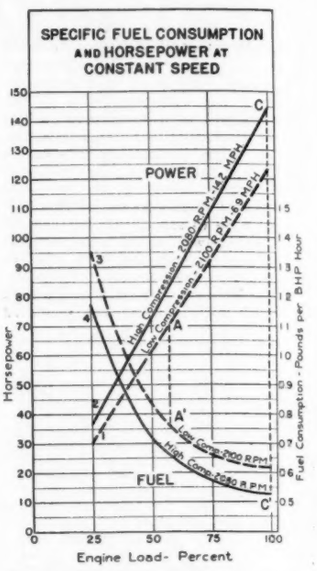

SPECIFIC FUEL CONSUMPTION AND HORSEPOWER AT CONSTANT SPEED
POWER
High Compression - 2080 R.P.M.-48.1 M.P.H.
Low Compression - 2100 R.P.M.-48.6 M.P.H.
FUEL
Low Comp. 2100 R.P.M.
High Comp. 2080 R.P.M.
Horsepower
Fuel Consumption - Pounds per B.H.P. Hour
Engine Load - Percent

Fig. 8—Fuel consumption of vehicle of Fig. 7

are commercial vehicles and the average gasoline consumption is far in excess of that for passenger car engines. Some of the large trucks use as much as 250 gallons of fuel every 24 hours hence it is obvious that the percentage of total gasoline consumed by commercial engines is considerably greater than the number of vehicles would indicate.

Peculiar performance of some fuels in certain commercial vehicles has been reported. For example, a winter gasoline of the same octane number as the summer gasoline previously used gave much less mileage and knocked severely under all conditions whereas the summer gasoline did not knock at all. The whole question of the volatility and knocking tendency of fuels for commercial engines is in need of investigation and can perhaps be taken up by the Co-operative Fuel Research Committee.

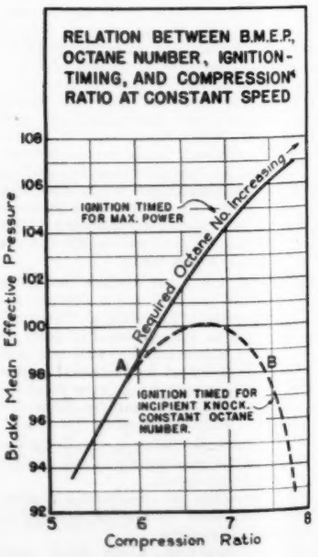

RELATION BETWEEN B.M.E.P, OCTANE NUMBER, IGNITION-TIMING, AND COMPRESSION RATIO AT CONSTANT SPEED
IGNITION TIMED FOR MAX. POWER
Required Octane No. Increasing
IGNITION TIMED FOR INCIPIENT KNOCK. CONSTANT OCTANE NUMBER.
Brake Mean Effective Pressure
Compression Ratio

Fig. 9

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More Refineries Now Operating in United States Than Ever Before in History of Oil Industry

By W. T. ZIEGENHAIN

Contrary to the general trend in manufacturing, the refining industry is increasing the number of its plants and March 1, 1934, records the highest number of plants in that industry's history. There are now 628 refineries in the United States, of which 483 are in operation. This represents an increase over the past year of approximately 60 plants both in total number and in the number of those operating. This large increase in number is due almost entirely to the rapidly growing refining industry in the East Texas area. It also reflects the belief that better days are ahead for the refining business.

Going into the matter of capacity, based upon the volume of crude which these new plants are capable of processing, it becomes evident from a detailed study that the total increase is relatively small and the conclusion is rightfully drawn that the new plants in general are small.

In the past year approximately 100,000 bbls. of refinery capacity has been added in the United States and brings the total capacity of operating plants in this country on March 1 up to 3,790,593 bbls., exceeded only by the capacity of plants operating on March 1, 1931.

While these data permit a rather optimistic view to be taken for the present it should be shown here also that there are about the same number of idle plants now as there was a year ago. The accompanying table shows a total of 145 idle plants now and a year ago there were 143.

This permits a general conclusion to be drawn in regard to the trend of refining capacity during the past year which might be briefly summarized as follows—there was no occasion to increase the capacity of existing refineries but there were opportunities to purchase crude advantageously in certain fields sufficiently near to consuming centers to justify the building of many small, temporary refineries. Almost without exception these plants involved a relatively small investment, are not equipped with efficient cracking equipment and after "cheap" oil passes out of the picture, owners of these plants will have to decide whether they are to make permanent improvements, or run the equipment until it will no longer stand.

Texas Shows Largest Growth

Because of the rapidity with which the East Texas Field was developed from a crude producing standpoint and because the flood of oil which came early in 1933 gave promise of an abundant supply of cheap crude for at least several years to come, many more small refineries were built to bring the total at present to 64. These account for much of the total gain in the number of Texas plants shown in the accompanying table. One year ago Texas was credited with having a total of 157 refineries, 120 of which were operating. Today Texas accounts for a total of 209 refineries, 165 of which are operating.

California Loses Position

California was forced to give up its lead in total refining capacity among all states to Texas as a result of these new plants and Texas can now claim title to being the only state in the union having a refining capacity in excess of 1,000,000 bbls. daily.

Texas also exceeds California in the capacity of operating refineries but the margin of difference is not so great.

Growth of Refinery Capacity in United States

Year—	Number of refineries	Combined crude capacity (bbls. daily)	Number of operating refineries	Capacity of operating refineries (bbls. daily)
1914	176	.....	...	.....
1918	267	1,186,155	...	.....
1919	289	1,295,115	...	.....
1920	373	1,530,565	...	.....
1921	415	1,888,800	...	.....
1922	479	2,164,050	325	1,854,590
1924	574	3,046,790	362	2,549,490
1925	584	3,033,682	385	2,680,052
1926	515	3,068,340	356	2,770,340
1927	462	3,224,307	328	2,964,427
1928	456	3,426,330	315	3,116,930
1929	463	3,719,550	341	3,454,250
1930	479	3,972,460	362	3,721,360
1931	500	4,164,080	397	3,913,180
1932	510	4,093,370	383	3,665,830
1933	567	4,125,250	424	3,696,410
1934	628	4,243,033	483	3,790,593

Other States Show Little Change

The refining capacity of other states shows very little change as might be expected. There was a tendency during the year for many oil producers throughout the Rocky Mountain and West Texas areas to build 5 to 50-bbl. skimming plants to supply their own and purely local demands for gasoline and fuel oil. These plants might be classed as refineries but neither the owners nor the industry intends that they be considered more than temporary and they will give way to modern, well equipped plants when a normal economic balance is reached in which the producer is able to sell his crude at a profitable price and refinery prices are raised to permit the building of permanent units.

Status of Cracking

In the past year relatively little cracking equipment was added. This was largely the result of two factors. In the past year gasoline prices were low due to cheap crude and the public was so price conscious that refiners in general did not make enough money to justify doing more than keep their existing cracking equipment in safe repair.

The second major factor was making available Q brand Ethyl fluid to improve the antiknock value of straightrun to the point where it was not necessary to crack as much to meet a given market requirement.

However, 1933 should be considered as the "exception" in the train of refining developments in which cracking has shown up as a growing factor in supplying the total motor fuel requirements of the country.

This period of two years or more in which but few cracking units were built will have to be made up eventually because there has been no slowing down in the demand for motor fuels of high octane value and it is generally recognized that it is cheaper to raise the octane value of the refinery gasoline by cracking to a certain point after which it is cheaper to add Ethyl fluid rather than attempt to do the job with lead alone.

We now seem to be entering the period where it will be necessary to replace some of the obsolete cracking equipment and the next wave of major construction that is forecast for the industry comes in the form of a prediction that the cracking unit will be the refinery and that which we now consider as the skimming unit will pass out of the picture. Its work will be done by the exchange of otherwise waste energy from the cracking unit. Several such units have been built in the past year as the forerunner of their general adoption and many more are on the drafting table.

Solvent Plants

Over the immediate future the program for modernizing cracking facilities will have to share interest among refiners with another endeavor, namely, the investigating and building of solvent extraction and dewaxing plants to produce lubricants with a substantially higher viscosity index, lower carbon residue and lower cold test.

Changes Geographically

During 1933 the industry experienced an unprecedented increase in the number of refineries built and this has been explained. It is not likely that 1934 will witness an equal expansion as far as numbers are concerned but there are factors in operation which might definitely favor shifting existing refining capacity to other areas. One such factor could be the divorcement of pipe lines and the other, the building of gasoline pipe lines.

The first factor would tend to cause small refineries to be built away from the crude producing fields and the building of gasoline lines tends to hold them or cause new ones to be built in the producing areas. So long as there is an excess of total refining capacity, however, and refined oil prices remain unattractively low, any changes which would be influenced through the operation of the two factors mentioned would come slowly.

REFINERY OPERATIONS IN THE UNITED STATES SEGREGATED ACCORDING TO PLANT LOCATION

(Capacities given in barrels daily as of March 1, 1934)

State—	No. of plants	Daily crude capacity (bbls.)	No. of plants operating	Crude capacity operating plants	No. of shut down	Crude capacity plants shut down
Alabama	1	6,000	0	0	1	6,000
Arizona	1	1,000	0	0	1	1,000
Arkansas	11	46,250	8	39,750	3	6,500
California	83	899,450	60	825,650	23	73,800
Colorado	6	7,400	6	7,400	0	0
Georgia	2	9,000	2	9,000	0	0
Illinois	13	135,150	10	125,450	3	9,700
Indiana	7	200,100	5	197,000	2	3,100
Iowa	1	1,500	0	0	1	1,500
Kansas	25	174,800	23	170,800	2	4,000
Kentucky	15	37,350	11	28,450	4	8,900
Louisiana	17	234,400	11	199,100	6	35,300
Maryland	4	62,000	3	55,000	1	7,000
Massachusetts	2	48,000	2	48,000	0	0
Michigan	7	21,500	5	19,000	2	2,500
Mississippi	1	1,000	0	0	1	1,000
Missouri	3	23,000	3	23,000	0	0
Montana	27	33,103	21	23,853	6	9,250
New Jersey	9	262,000	9	262,000	0	0
New Mexico	10	10,100	7	5,800	3	4,300
New York	5	55,500	5	55,500	0	0
Ohio	17	106,990	14	103,990	3	3,000
Oklahoma	66	348,570	44	286,170	22	62,400
Pennsylvania	49	299,500	42	288,650	7	10,850
Rhode Island	2	11,000	2	11,000	0	0
South Carolina	1	6,500	1	6,500	0	0
Tennessee	2	1,000	0	0	2	1,000
Texas	209	1,121,605	165	929,655	44	191,950
Utah	4	8,650	3	8,400	1	250
Virginia	1	2,000	1	2,000	0	0
Washington	2	1,500	0	0	2	1,500
West Virginia	6	17,250	6	17,250	0	0
Wyoming	19	49,865	14	42,225	5	7,640
Total	628	4,243,033	483	3,790,593	145	452,440

Personnel of Refining Companies in United States

ABBREVIATIONS USED:

Chm. Bd.—Chairman of Board
Pres.—President
V. P.—Vice President
Sec.—Secretary
Treas.—Treasurer
Gen. Mgr.—General Manager
Gen. Supt.—General Superintendent
Sales Mgr.—Sales Manager
Tank Car S. M.—Tank Car Sales Manager
Station S. M.—Station Sales Manager
Pur. Agt.—Purchasing Agent
Traf. Mgr.—Traffic Manager
Ch. Egr.—Chief Engineer
Supt.—Superintendent
Asst. Supt.—Assistant Superintendent
Ch. Chem.—Chief Chemist

A

Aetna Oil Service, Inc., 1202 South Third St., Louisville, Ky.
V. P., W. R. Abbott
Sec., W. T. Davis
Treas., W. R. Abbott
Gen. Supt., E. E. Van Buren
Tank Car S. M., H. J. Flanders
Station S. M., Julius Malkemus
Pur. Agt., E. C. Wolff
Traf. Mgr., Charles Price
Refinery located at Louisville, Ky.

Alamo Refining Co., Taylor, Tex.
Pres., G. L. Rowsey
V. P., J. G. Pundt
Sec. and Treas., C. W. Cahoon, Jr.
Gen. Mgr., G. L. Rowsey
Tank Car S. M., C. W. Cahoon, Jr.
Supt., G. R. Whitener
Ch. Egr., G. R. Whitener
Ch. Chem., G. R. Whitener
Pur. Agt., Ben H. Harrison
Traf. Mgr., H. B. Cole
Refinery located at Willow Springs, Tex.

Allegheny Arrow Oil Co., Gambrinus Road, Canton, Ohio.
Pres., F. F. Crowley
V. P., Wm. M. Thompson
Sec., Daniel C. Funk
Treas., Wm. M. Thompson
Ch. Chem., Earl F. Wittmer
Gen. Mgr., F. F. Crowley
Gen. Supt., Reid Brazell
Pur. Agt., Reid Brazell
Tank Car S. M., Wm. M. Thompson
Station S. M., J. F. Kennedy
Traf. Mgr., Paul T. Foust
Refinery located at Canton, Ohio.

Allstate Refining Co., Thrall, Tex.
Pres., H. H. Coffield
V. P., Geo. P. Mann
Sec. and Treas., J. H. Edwards
Gen. Mgr., J. H. Edwards
Gen. Supt., Geo. P. Mann
Asst. Supt., L. E. Palmer
Tank Car S. M., J. H. Edwards, Box 165, Overton, Tex.
Refinery located at Thrall, Tex.

Altitude Petroleum Corp., Kennedy Bldg., Tulsa, Okla.
Pres., I. Arthur Anson
V. P., M. Lloyd Freese
Sec., C. H. Warner, Jr.
Treas., R. Wyman
Gen. Mgr., I. Arthur Anson
Gen. Supt., M. Lloyd Freese
Ch. Egr., M. E. Gray
Supts., James A. Peacock, Oklahoma City, Okla.; R. W. Lind, Chanute, Kans.; E. S. Horner, Kansas City, Mo.
Tank Car S. M., C. H. Warner, Jr.
Pur. Agt., H. C. Jenkins
Traf. Mgr., T. R. Clement
Refineries located at Oklahoma City, Okla., Chanute, Kans., and Kansas City, Mo.

American Petroleum Co., Petroleum Bldg., Houston, Tex.
Pres., Craig F. Cullinan
V. P., R. S. Tucker, James P. Lavery
Sec., G. L. Townsan
Treas., C. T. Carnes
Supt., R. C. Cook, Norsworthy, Tex.
Tank Car S. M., James P. Lavery
Ch. Egr., John H. Bringhurst
Ch. Chem., H. P. Sellers
Pur. Agt., J. A. McClarty
Refinery located at Norsworthy, Tex.

Anderson-Prichard Oil Co., Colcord Bldg., Oklahoma City, Okla.
Pres., L. H. Prichard
V. P., J. Steve Anderson
Sec. and Treas., Paul A. Anderson
Gen. Mgr., L. H. Prichard
Gen. Supt., Geo. H. Burruss
Asst. Supt., M. B. Burruss
Mgr. Ref. Oil Sales, C. L. Mayhall
Mgr. Tech. Naphtha Sales, C. H. Dresser
Ch. Egr., Geo. H. Burruss
Pur. Agt., Wm. Sturges
Traf. Mgr., M. H. Champion
Refinery located at Cyril, Okla.

Archer Refining Corp., 801 City National Bldg., Wichita Falls, Tex.
Pres., Geo. G. Golden
V. P., W. H. Yeargen
Supt., W. E. Hames
Gen. Mgr., Geo. G. Golden
Tank Car S. M., Geo. G. Golden
Station S. M., W. H. Yeargen
Pur. Agt., Geo. G. Golden
Refinery located at Megargel, Tex.

Arro Oil & Refining Co., 603 Montana Bldg., Lewistown, Mont.
Pres., H. H. Schwartz
V. P., E. L. Allen
Sec., Guy R. Enlow
Treas., E. L. Allen
Gen. Supt., Paul Jones
Tank Car S. M., T. R. Gilmour
Pur. Agt., E. L. Allen
Traf. Mgr., T. R. Gilmour
Refinery located at Lewistown, Mont.

Arrow Refining & Producing Co., Fort Worth National Bank Bldg., Fort Worth, Tex.
Pres., H. B. May
V. P.s, C. W. Curtis, O. B. Stephens
Sec. and Treas., O. B. Stephens
Gen. Mgr., C. B. Curtis
Gen. Supt., H. J. Toups
Tank Car S. M., Henry B. May, Jr.
Pur. Agt., H. B. May
Refineries located at Overton, Tex., and McAllen, Tex.

Ashland Refining Co., Second National Bank Bldg., Ashland, Ky.
Pres. and Gen. Mgr., Paul G Blazer
V. P., R. W. Grossenbach
Sec., E. L. McDonald, Lexington, Ky.
Treas., E. W. Seaton
Gen. Supt., F. W. Irwin
Tank Car S. M., E. F. Wells
Ch. Chem., John Dom
Pur. Agt., M. K Lovell
Traf. Mgr., P. H. Banks
Station S. M., A. A. Hines
Refinery located at Catlettsburg, Ky.

Associated Oil Co., 79 New Montgomery St., San Francisco, Calif. (Subsidiary of Tide Water Associated Oil Co.)
Pres., Wm. F. Humphrey
V. P., L. F. Bayer, L. D. Jurs, B. I. Graves, J. H. Jenkins, E. L. Shea, W. A. Sloan
Sec., J. P. Edwards
Treas., W. A. Sloan
Gen. Supt., Wm. P. Hugo, Associated, Calif.; F. E. Coyle, Wilmington, Calif.
Asst. Gen. Supt., T. O. Edwards, Jr., Associated, Calif.
Supt., Frank Harris, Wilmington, Calif.
Domestic S. M., P. E. Allan
Fuel Oil S. M., E. Whitehead
Ch. Egr., H. B. Haney
Ch. Chem., L. Mittelman, Associated, Calif.; E. J. Lange, Wilmington, Calif.
Pur. Agt., A. P. MacKillop
Traf. Mgr., R. Hutcherson
Refineries—Avon Refinery, Associated, Calif.; Watson Refinery, Wilmington, Calif.

Atlantic Refining Co., 260 S. Broad St., Philadelphia, Pa.
Chm. Bd., J. W. Van Dyke
Pres., W. M. Irish
V. P.s, W. D. Anderson, R. D. Leonard, E. J. Henry, E. R. Cox, T. G. Redbridge
V. P. and Sec., W. M. O'Connor
Treas., R. H. Colley
Mgrs. Ref., H. M. Nichols, Philadelphia, Pa.; G. E. Glines, Franklin, Pa.; G. H. Weaver, Pittsburgh, Pa.; M. J. Welsh, Brunswick, Ga.
Asst. Mgrs. Ref., W. F. Stroud, Jr., Philadelphia, Pa.; B. H. Waterbury, Franklin, Pa.; R. P. Horner, Pittsburgh, Pa.; R. Stewart, Brunswick, Ga.
Head of Dev. and Research, T. G. Delbridge
Domestic S. M., R. D. Leonard
Exports S. M., W. D. Anderson
Ch. Egr., W. Samans
Ch. Chem., Dr. J. B. Hill
Pur. Agt., S. S. Parks
Mgr. Trans., R. C. Tuttle
Refineries located at Philadelphia, Pa.; Franklin, Pa.; Pittsburgh., and Brunswick, Ga.

B

B. & F. Oil & Refining Co., P.O. Box 1, Culver City, Calif.
Refinery located at Playa Del Rey, Calif.

Bachmann Petroleum Corp., 1841 East Twenty-ninth St., Long Beach, Calif.
Refinery located at Long Beach, Calif.

Barber Asphalt Co., 1600 Arch St., Philadelphia, Pa.
Pres., Arthur W. Sewall
V. P.s, C. W. Bayliss, Frank Seamans
Sec., E. R. Riter
Treas., F. J. Robertson
Prod. Mgr., John H. Weller
Supt., Joseph Slutzker
Asst. Supt., H. J. Fleischer
Tank Car S. M., H. C. Hottel (Gen Office)
Ch. Egr., Chas. T. McGrady, Maurer, N. J.
Director Techn. Bureau, J. S. Miller, Jr., Maurer, N. J.
Pur. Agt., John H. Weller, General Office; A. J. Hollenbach, Maurer, N. J., Local Purchases
Traf. Mgr., Joseph P. Brown (General Office)
Refinery located at Maurer, N. J.

Barnsdall Refineries, Inc., Petroleum Bldg., Tulsa, Okla.
Pres., E. B. Reeser
V. P.s, F. E. Holsten, Chg. Mfg.; Geo. D. Locke, Chg. Sales; D. L. Frawley
Sec., Jas. A. Dunn
Treas., C. E. Votrian
Supts., G. T. Granger, Okmulgee, Okla.; V. R. Oakley, Barnsdall, Okla.; Frank S. Horne, Wichita, Kans.
Asst. Supts., J. V. Brazier, Barnsdall, Okla.
Tank Car S. M., J. F. Adams
Pur. Agt., O. E. McClatchey
Traf. Mgr., R. E. Stewart
Refineries located at Okmulgee, Okla.; Barnsdall, Okla., and Wichita, Kans.

Basin Refining Co., Box 96, Aztec, N. Mex.
Pres., D. J. Lingenfelter
Refinery located at Aztec, N. Mex.

Bayou State Refining Corp., 1008 Slattery Bldg., Shreveport, La.
Pres., Frank M. Cook
V. P., Sidney M. Cook
Treas., Frank M. Cook
Gen. Mgr., Frank M. Cook
Supt., T. N. Reed
Tank Car S. M., Frank M. Cook
Ch. Egr., T. N. Reed
Traf. Mgr., F. D. Coons
Refinery located at Hosston, La.

Beacon Oil & Refining Co., Henderson, Tex.
Pres., J. E. Parker
Treas., F. P. Cannon
Sec., H. W. Roberts
Refinery located at Henderson, Tex.

Bell Oil & Gas Co., Kennedy Bldg., Tulsa, Okla.
Pres., S. L. Lubell
V. P., Albert Finston
Sec. and Treas., Jesse Finston
Gen. Mgr., Albert Finston
Supt., Rex Young
Tank Car S. M., Jesse Finston
Pur. Agt., J. N. Naron
Traf. Mgr., C. E. Caddieux
Refinery located at Grandfield, Okla.

Berry Asphalt Co., 6 North Michigan Ave., Chicago
Pres., C. E. Miller
V. P., J. D. Berry
Sec. and Treas., C. D. Berry
Gen. Mgr., Carl E. Miller
Supt., J. W. Smith, Waterloo, Ark.
Pur. Agt., J. W. Smith
Traf. Mgr., S. H. Giesy
Refinery located at Waterloo, Ark.

Berry, James B., Sons' Co., Inc., Oil City, Pa. (Subsidiary of Quaker State Oil Refining Corp.)
Pres., James D. Berry
V. P., S. Messer
Sec. and Treas., Chas. D. Berry
Gen. Supt., G. B. Hunter
Tank Car S. M., Frank Berry
Refinery located at Oil City, Pa.

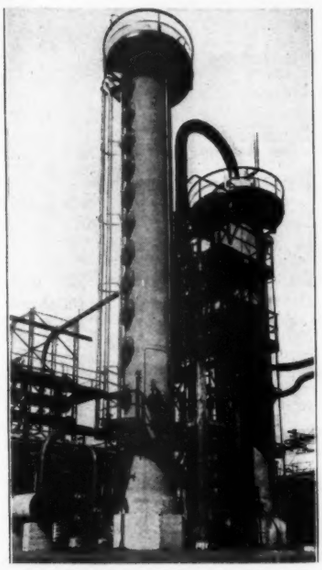
Bighorn Oil & Refining Co., East Fourth Ave., North, Billings, Mont.
Pres., Paul Stock
V. P., E. J. Fleming
Sec., Treas and Gen. Mgr., J. G. Everett
Gen. Supt., T. R. Graham
Asst. Supt., J. E. Simon
Tank Car. S. M., J. G. Everett
Ch. Chem., J. E. Simon
Refinery located at Billings, Mont.

Big West Oil Co., 615 Hutton Bldg., Spokane, Wash.
Pres., L. R. Hawley
V. P.s, Chas. P. Lund; F. D. Fobes
Sec. and Treas., John E. Orr
Asst. Sec. and Treas., M. D. Prince
Gen. Mgr., L. R. Hawley
Asst. Supt., Jerry Kincaid
Supt., George Engle
Ch. Chem., E. B. Loyfield
Pur. Agt., G. W. Belt, Amed Soderstrom, George Engle
Tank Car and Station S. M., Amed Soderstrom
Traf. Mgr., Amed Soderstrom
Refinery located at Kevin, Toole County, Mont.

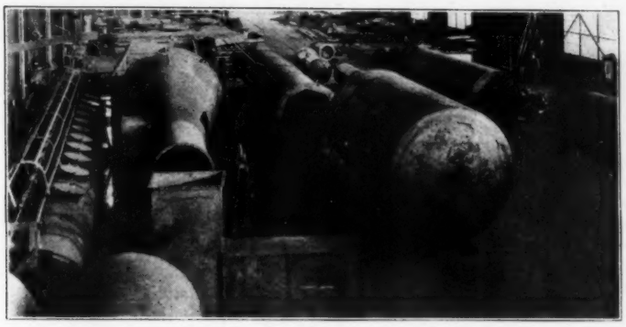
Black Gold Refining Co., 721 Commerce Exchange Bldg., Oklahoma City, Okla.
Pres. and Gen. Mgr., D. A. Corcoran
V. P. and Gen. Supt., A. M. Edmiston
Sec., C. H. Marshall
Treas., C. W. Scott
Tank Car S. M., C. W. Scott
Station S. M., C. H. Hunter
Traf. Mgr., C. H. Marshall
Refinery located at Oklahoma City, Okla.

Bluebonnet Oil Refining Co., 1509 Magnolia Bldg., Dallas, Tex.
Pres., B. L. Woolley
V. P., B. W. Woolley
Sec. and Treas., C. R. McClinnahan
Gen. Mgr., B. L. Woolley
Gen. Supt., T. D. Warner
Tank Car S. M., B. W. Woolley

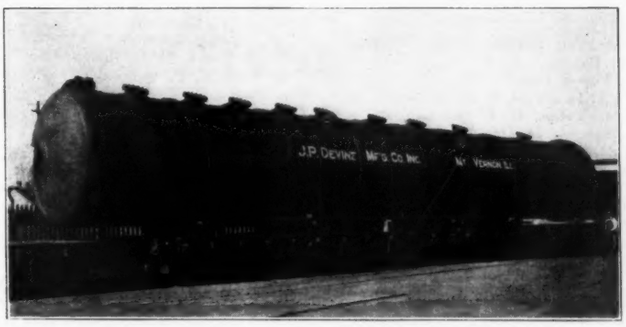
J. P. Devine MFG. CO.
REFINERY EQUIPMENT



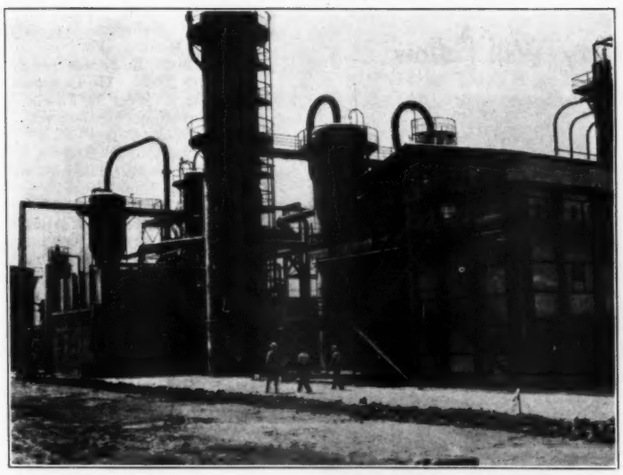
COMPLETE CRACKING PLANT ERECTED BY US



MISCELLANEOUS DISTILLATION EQUIPMENT



CRACKING PLANT FRACTIONATING TOWER



A COMPLETED CRACKING PLANT, PARTS OF WHICH WERE FABRICATED IN OUR SHOPS

May we bid on your requirements for Heat Exchangers, Fractionating Towers, Pressure Vessels and Furnaces? X-Ray and annealing go with our welded pressure jobs. We have stress-relieving equipment up to 11 feet diameter and can fabricate plate work from 2″ to 4″ thick. We build to your own or our design and save you money. Fine shop work and field erection of complete plants is our specialty.

J. P. DEVINE MFG. CO., INC.

MOUNT VERNON, ILL.—*Subsidiary of Mt. Vernon Car Mfg. Co.*

NOTICE

Our manufacturing plant includes a large stress-relieving oven to handle 11 feet diameter welded vessels up to 100 feet in length, also X-Ray department to fabricate Class 1 equipment.

Pur. Agt., B. L. Woolley
Refinery located at Wickett, Tex.

Boris (A. S. Aronow), Shelby, Mont.
Owner, Boris A. S. Aronow
Supts., Don J. Baize, Kalispell, Mont., and Elias Hauskin, Havre, Mont.
Sales Mgr., Sedor Aronow
Ch. Egr. and Ch. Chem., Don J. Baize
Pur. Agt. and Traf. Mgr., Boris A. S. Aronow
Refineries located at Kalispell, Mont., and Havre, Mont.

Bowling Green Refining Co., Inc., Memphis Junction, Ky.
Pres., Ben F. Medley
V. P., A. C. Deer
Sec., H. T. Downing
Treas., M. A. Arvin
Gen. Mgr., A. C. Deer
Gen. Supt. Refs., M. C. Sumpter
Asst. Supt., H. G. Taggart
Tank Car S. M., D. E. Foster, Box 605, Bowling Green, Ky.
Station S. M., D. E. Foster
Ch. Chem., M. C. Sumpter, Box 605, Bowling Green, Ky.
Traf. Mgr., T. C. Ridge, 1604 Heyburn Bldg., Louisville, Ky.
Refinery located at Memphis Junction, Ky.

Bradford Oil Refining Co., Bradford, Pa.
Pres., J. H. Rose
V. P., F. D. Korner
Sec. and Treas., H. G. Barcroft
Gen. Mgr., John P. Andrews
Gen. Supt., H. C. Salisbury
Tank Car and Station S. M., H. C. Loveless
Ch. Egr., John P. Andrews
Ch. Chem., H. C. Salisbury
Traf. Mgr., D. R. Hennessy
Refinery located at Bradford, Pa.

Bradford Penn Refining Corp., Clarendon, Pa.
Pres., Forest Dorn
V. P., A. D. David, J. H. Anderson
Sec. and Treas., R. J. Brennan
Gen. Mgr., A. D. David
Gen. Supt., A. D. David
Supt., E. M. Hyatt
Ch. Chem., W. A. Johnston
Refinery located at Clarendon, Pa.

Bush, R. R., Refinery, 2790 Cherry Ave., Long Beach, Calif.
Owner, R. R. Bush
Gen. Mgr., W. H. Morgan
Gen. Supt., William E. Snowden
Tank Car and Station S. M., W. N. Fox
Ch. Chem., P. S. Bessor
Pur. Agt., G. N. Crowther
Refinery located at Long Beach, Calif.

C

California Northern Corp., 1924 Broadway, Oakland, Calif.
Pres., O. F. Darling
V. P., L. S. Flaherty
Sec. and Treas., H. J. Steiner
Gen. Mgr., O. F. Darling
Lubricating oil plant, Coalinga, Calif.

Caminol Co., Ltd., 112 West Ninth St., Los Angeles, Calif.
Pres., C. B. Colby
V. P., R. E. Hines
Sec., Thomas H. Lipps
Gen. Mgr., R. E. Hines
Gen. Supt., R. C. Colvin
Tank Car S. M., J. M. MacElwain
Station S. M., F. R. Sheller
Ch. Egr., R. C. Colvin
Pur. Agt., B. A. Sahlman
Refineries located at Santa Fe Springs, Calif., and Hanford, Calif.

Canfield Oil Co., 3216 East Fifty-fifth St., Cleveland, Ohio.
Pres., Louis Carruth
V. P., Charles McLean
Sec., H. M. Carruth
Treas., J. A. Jackson
Supts., R. W. Helm, Coraopolis, Pa.; A. C. Minch, Cleveland, Ohio
Tank Car S. M., John R. Nelson
Ch. Egr. and Chem., Louis W. Hodous
Pur. Agt., M. C. Dippel
Traf. Mgr., J. T. Mullaney
Refineries located at Coraopolis, Pa., and Cleveland, Ohio

Canyon Oil & Gas Co., Cisco, Tex.
Pres., Tom Bryant
V. P., A. E. Bryant
Sec. and Treas., R. Elliott Bryant
Refinery located at Cisco, Tex.

Capitol Crude Oil Co., 1020 Subway Terminal Bldg., Los Angeles, Calif.
Pres., E. P. Clark
Refinery located at Santa Paula, Calif.

Carbide & Carbon Chemicals Corp., 30 East Forty-second St., New York, N. Y.
Pres., J. A. Rafferty
V. P.s, G. O. Curme, Jr., J. G. Davidson, J. W. McLaughlin, H. E. Thompson, R. W. White
Sec., A. C. Cornell
Treas., C. T. Ayers
Gen. Supt., G. B. Landes
Supt., C. S. Heath, S. Charleston, W. Va.
Sales Mgr., W. F. Reich, Jr.
Ch. Egr., C. S. Heath
Ch. Chem., G. V. Scofield
Pur. Agt., W. S. Ackerman
Refinery located at South Charleston, W. Va.

Carnegie Refining Co., Box 543, Carnegie, Pa.
Pres., H. A. Logan, Warren, Pa.
V. P.s, George L. Craft, Warren, Pa.; F. G. Bannerot, Pittsburgh, Pa.
Sec., W. C. Heasley, Warren, Pa.
Treas., F. G. Bannerot, Pittsburgh, Pa.
Tank Car S. M., J. Earl French
Ch. Chem., Charles E. Howk
Traf. Mgr., J. Earl French
Refinery located at Carnegie, Pa.

Carson, M. D., Refinery, Brady, Tex.
Sole Owner, M. D. Carson
Ch. Egr. and Chem., J. M. Carson
Refinery located at Brady, Tex.

Cedar Grove Refining Co., Shreveport, La.
Pres., E. F. Griswold
V. P., Louise Griswold
Sec. and Treas., H. D. Boone
Gen. Mgr., E. F. Griswold
Gen. Supt., R. K. Rose
Traf. Mgr., J. F. Smith
Tank Car S. M., E. F. Griswold
Pur. Agt., E. F. Griswold
Refinery located at Shreveport, La.

Chalmette Petroleum Corp., 922 Union Bldg., New Orleans, La.
Pres., B. C. McClellan
Exec. V. P., D. B. Williams
V. P.s, Charles Leftwich, W. Irving Moss, C. D'Antoni
Sec., R. P. Batson
Treas., William Leftwich
Supt., H. L. McMenemy, Chalmette, La.
Asst. Supt., J. C. Senter, Chalmette, La.
Sales Mgr., George P. Gillette
Ch. Chem., Aaron Abramson
Pur. Agt., V. G. McPherson
Traf. Mgr., J. E. Loper
Refinery located at Chalmette, La.

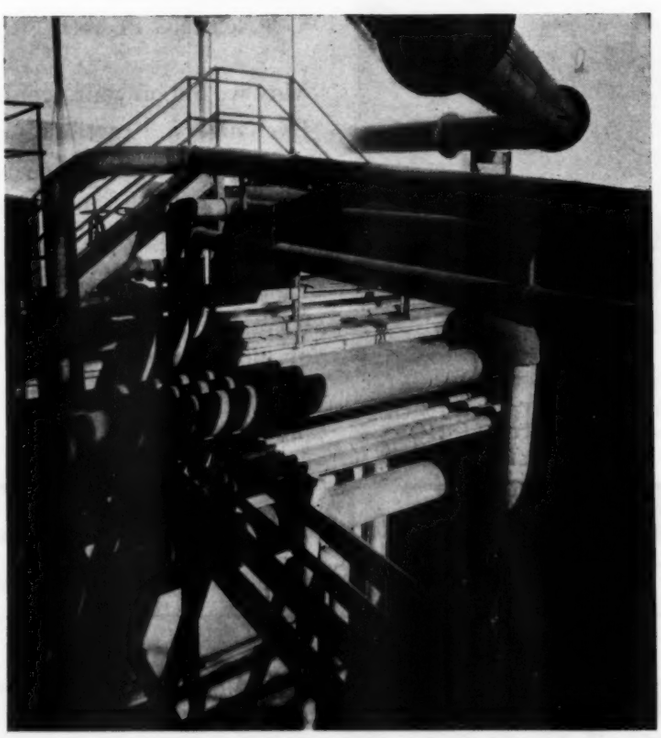
Champlin Refining Co., Enid, Okla.
Pres., H. H. Champlin
V. P.s, Fred C. Champlin, Joe N. Champlin
Sec. and Treas., D. W. Cotton
Asst. Sec. and Treas., G. Wilkenson
Gen. Supt., E. J. Slater
Tank Car S. M., L. A. Snyder
Station S. M., A. H. Holland
Pur. Agt., L. E. Noble
Traf. Mgr., J. L. Morgan
Refinery located at Enid, Okla.

Chanslor-Canfield Midway Oil Co., 301 Keickhoff Bldg., Los Angeles, Calif.
Pres., F. C. Ripley
Refinery located at Brea Olinda, Calif.

Chief Refining Co., Inc., Gladewater, Tex.
Pres., H. C. Haberle
V. P., Mrs. L. B. Haberle
Sec. and Treas., L. B. Haberle
Gen. Mgr., L. B. Haberle
Gen. Supt., B. J. Moreau
Tank Car S. M., Neil R. Cooper
Ch. Chem., J. R. Hurmans
Pur. Agt., B. J. Moreau and Neil R. Cooper
Traf. Mgr., Neil R. Cooper

Cities Service Refining Co., 260 Tremont St., Boston, Mass. (Subsidiary Cities Service Co.)
Pres., Henry L. Doherty, 60 Wall St., New York
V. P.s, W. A. Jones, Harry D. Frueauff, 60 Wall St., New York; J. S. Cordell, 260 Fremont, Boston.
Sec., J. V. Koons
Asst. Treas., E. H. Johnston
Gen. Mgr., John S. Cordell
Gen. Supt., L. M. Bound
Supt., D. P. Sturges, East Braintree, Mass.
Asst. Supt., L. A. Besselman
Tank Car S. M., J. A. Kelley
Station S. M., T. J. Spellman
Ch. Egr., A. P. Nelson, East Braintree, Mass.
Ch. Chem., A. H. Alden, East Braintree, Mass.
Pur. Agt., C. L. Boyle
Traf. Mgr., W. A. Hamel
Refinery located at East Braintree, Mass.

Lines the 1934 Refinery Will Follow



An installation of various sized lines that serve as part of a lubricating oil distillation unit in the Whiting, Indiana, refinery of the Standard Oil Co. (Indiana)

Cole, L. S., Refining Co., Box 108, Oklahoma City, Okla.
Owner, L. S. Cole
Refinery located at Oklahoma City, Okla.

Colonial Beacon Oil Co., Inc., 285 Columbus Ave., Boston, Mass. (Subsidiary of Standard Oil Co. of New Jersey).
Pres., A. Clarke Bedford
V. P.s, E. N. Wrightington, J. R. Riddell
Treas., E. N. Wrightington
Gen. Mgr. Ref., D. L. Ferguson
Tank Car S. M., J. C. Richdale
Bulk S. M., A. M. Bruce
Ch. Egr., H. L. Bolton
Ch. Chem., J. F. Marr
Pur. Agt., A. F. Whiting
Traf. Mgr., J. H. Gies
Refinery located at Everett, Mass.

Col-Tex Refining Co., Colcord Bldg., Oklahoma City, Okla.
Pres., L. H. Prichard
V. P., J. Steve Anderson
Sec. and Treas., Paul H. Anderson
Gen. Mgr., L. H. Prichard
Supt., George H. Burruss, Colorado, Tex.
Asst. Supt., M. H. Lipp, Colorado, Tex.
Tank Car and Station S. M., C. L. Mayhall
Ch. Egr., George H. Burruss
Pur. Agt., William Sturges
Traf. Mgr., M. H. Champion
Refinery located at Colorado, Tex.

Concho Refining Co., Box 79, San Angelo, Tex.
Pres., R. D. Lavery
V. P.s, Owen F. McGee, James Farrel
Refinery located at San Angelo, Tex.

Conewango Refining Co., Market St. Ext., Warren, Pa.
Pres., Harry R. Lewis
Sec. and Treas., H. B. Goetz
Gen. Mgr., Harry R. Lewis
Gen. Supt., W. L. Gettings
Ch. Egr., A. Gohn
Ch. Chem., R. S. Dawson
Tank Car S. M., Harry R. Lewis
Pur. Agt., Tom Moore
Traf. Mgr., Marian Finley
Refinery located at Warren, Pa.

Conrad Refining Co., Conrad, Mont.
Pres., Perry L. Withers
V. P., E. H. Withers
Sec. and Treas., D. L. Simon
Gen. Mgr., Perry L. Withers
Supt., Ellsworth Withers, Conrad, Mont.
Sales Mgr., Perry L. Withers.
Refinery located at Conrad, Mont.

Conroe Oil & Refining Co. (Grank Lake), Conroe, Tex.
Pres., A. N. Munhall
V. P., Thos. Kehoe
Sec. and Treas., W. J. Pfiffner
Supt., A. N. Munhall
Refinery located at Conroe, Tex.

Consolidated Pacific Refining Co., 869 Irolo St., Los Angeles, Calif.
Operators, D. E. Brown, O. M. Sullivan
Refinery located at Santa Fe Springs, Calif.

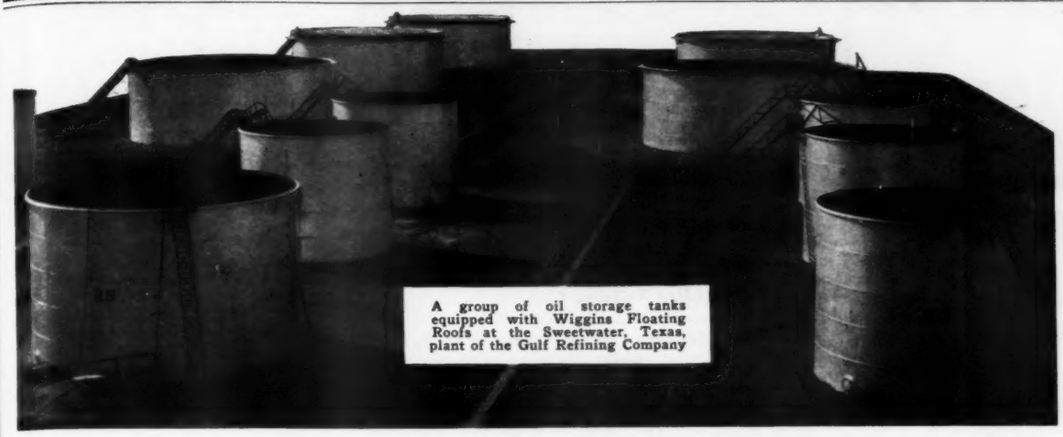
Constantin Refining Co., Overton, Tex.
Owner, J. F. Constantin
Refinery located at Overton, Tex.

Consumers Refining Co., Conrad, Mont.
Same officers as Conrad Refining Co.
Refinery located at Collins, Mont.

Continental Oil Co., Ponca City, Okla.
Pres., Dan Moran
Exec. V.P.s, W. W. Bruce, W. H. Ferguson.
Gen. Counsel, James J. Cosgrove
V. P. Prod., E. J. Nicklos
V. P. Mfg., Walter Miller
V. P. Mkt., E. S. Karstedt

A TYPE OF STORAGE TANK

—to meet every evaporation problem



A group of oil storage tanks equipped with Wiggins Floating Roofs at the Sweetwater, Texas, plant of the Gulf Refining Company

Refineries protect gasoline quality with WIGGINS PONTOON ROOFS

EXPOSURE of gasoline to the air and consequent evaporation affects at least three desirable qualities of good gasoline: (1) It reduces the easy starting quality, (2) It lowers the knock rating, and (3) It tends to increase gum formation. Unprotected storage results not only in large volumetric losses but also in indirect losses occasioned by the extra refining effort required to offset the reduction in quality due to evaporation. On the other hand, the use of Wiggins Pontoon Roofs on products having Reid vapor pressures not greater than 10 lbs. per sq. in. prevents both these losses which, in a short time, equal the cost of the roofs.

Easy Starting

The customary index of this quality is the vapor temperature at which 10% of the sample is evaporated. Experience has shown that the 10% point temperature of average gasoline is increased about 4 deg. F. for each percent in evaporation loss. Tests conducted by one oil company showed that the sum of all evaporation losses in refinery storage, transportation, bulk storage, and at the filling station amounted to about 2.7% with unprotected storage and could be reduced to about 1.2% with Wiggins roofs. (See Table). This means corresponding increases of 11 deg. and 5 deg., respectively, in the 10% point temperature, or a saving of 6 deg.

Knock Rating

Since a high octane number in gasoline may be provided in varying degree by the light and heavy fractions, it is not possible to establish a definite relationship between evaporation and knock rating. It is obvious, however, that the octane number of any gasoline which depends for its quality on certain light fractions will suffer appreciably from evaporation. Such gasolines include those in which there is a blending with stabilized casing-head gasoline or with the light naphthas recovered from modern cracking processes.

EVAPORATION LOSSES

Operation	Ordinary Storage	Wiggins Floating Roof
Filling refinery storage	0.1	0.0
Refinery storage (4 mo.)	1.0	0.15
Filling barge	0.1	0.1
Filling bulk storage	0.1	0.0
Bulk storage (2 mo.)	0.5	0.05
Filling tank truck	0.3	0.3
Filling tank at filling station	0.3	0.3
Filling tank on motor vehicle	0.3	0.3
TOTAL	2.7	1.2

Gum Formation

The formation of gum on gasoline in contact with the atmosphere ordinarily takes place very slowly for a considerable period and then increases quite rapidly. If the period between refining and consuming is greater than this period of slow gum formation, the use of Wiggins Pontoon roofs on gasoline storage tanks is clearly beneficial.

Other Losses

Wiggins Pontoon Roofs protect gasoline not only against deterioration in quality, but also against the volumetric loss through evaporation of the lighter fractions, and against loss by fire. The same features of construction which keep vapor in and air out prevent evaporation losses and minimize the fire hazard. Since no explosive mixtures of air and oil vapor are formed, there is much less chance of destructive fires starting.

Easy to Apply

Wiggins Pontoon Roofs are easily installed on any tanks, either new or old. In the case of existing tanks in good condition, the only change necessary is the addition of a wind girder to strengthen the shell when the roof is in the lowered position.

Evaporation Engineering

If you are going to build new tanks or re-roof old ones, it may cost much less than you think to install Wiggins roofs. Why not determine for yourself exactly what the difference in cost will be and approximately, at least, what savings could be anticipated? Our engineers will gladly give you complete data on cost and offer constructive help in estimating savings that can be counted on. Be sure to give the capacity and size of tanks, the characteristics of the gasoline to be handled, climatic conditions, and any special considerations.

CHICAGO BRIDGE & IRON WORKS

DALLAS.....1241 Burt Bldg.
HOUSTON.....2919 Main Street
TULSA.....1606 Thompson Bldg.
BIRMINGHAM.....1536 Fiftieth St., N.
CHICAGO.....2128 Old Colony Bldg.
DETROIT.....1514 Lafayette Bldg.
CLEVELAND.....2204 Rockefeller Bldg.
NEW YORK.....3147 Hudson Terminal Bldg.
PHILADELPHIA..1615 1700 Walnut St. Bldg.
BOSTON.....1517 Consolidated Gas Bldg.
SAN FRANCISCO.....1054 Rialto Bldg.
SEATTLE.....4323 Smith Tower
LOS ANGELES.....1423 Wm. Fox Bldg.
HAVANA, CUBA.....Edificio Abreu
CABLE ADDRESS.....Chibridge

Fabricating Plants in BIRMINGHAM, CHICAGO and GREENVILLE, PA.

Assts. to Pres., R. E. Collom, G. B. Olds, Jr.
Sec., James J. Cosgrove
Treas., G. F. Smith
Gen. Sales Mgr., H. J. Kennedy
Ch. Ref. Egr., M. E. Clawson
Ch. Chem., B. H. Lincoln
Pur. Agt., W. H. O'Connor
Traf. Mgr., P. H. Kuhns
Refineries located at Ponca City, Okla.; Baltimore, Md.; Sapulpa, Okla.; Wichita Falls, Tex.; Florence, Colo.; Glenrock, Wyo.; Farmington, N. Mex.; Denver, Colo.; Albuquerque, N. Mex.; Lewistown, Mont.

Continental Refining Co., P.O. Box 175, Oil City, Pa.
Pres., Thos. A. Anderton
V. P., M. A. DeArman
Sec., S. S. DeArman
Treas., J. W. Anderton
Gen. Mgr., Thos. A. Anderton
Supt., I. L. Klein
Tank Car and Sta. S. M., C. F. Felton
Ch. Egr., J. C. Vogan
Ch. Chem., E. F. Hanna
Pur. Agt., H. Wiley
Traf. Mgr., D. C. Hasson
Refinery located at Oil City, Pa.

Cosden Oil Corp., 1700 Electric Bldg., Fort Worth, Tex.
Pres., J. S. Cosden
V. P.s, W. D. Richardson, A. G. Reed, T. R. Harley, C. D. Hartman
Sec. and Treas., J. J. Purcell
Gen. Mgr., W. D. Richardson
Supt., J. W. Coast, Big Spring, Tex.
Tank Car S. M., W. D. Richardson
Ch. Egr., S. J. Davis
Station S. M., B. G. Corsgreen, 8 S. Michigan Ave., Chicago.
Pur. Agt., E. E. Brogden
Traf. Mgr., Walker Wilson
Ch. Chem., Harry Eberard
Refinery located at Big Spring, Tex.

Crescent Oil & Refining Co., 7200 Manchester, Houston, Tex.
Pres., W. J. Hepworth
V. P., W. F. Hepworth
Sec. and Treas., L. R. Hepworth
Supt., H. C. Weynand
Tank Car and Sta. S. M., J. L. Eggert
Refinery located at Houston, Tex.

Crew-Levick Co., 400 North Broad St., Philadelphia, Pa. (Subsidiary of Cities Service Co.)
Pres., Henry L. Doherty
V. P.s, Chas. E. Foster, Harry D. Frueauff
Sec., Alvian R. Thorson
Treas., Walter W. Martin
Gen. Mgr., Charles E. Foster
Gen. Supt., J. W. Griswold
Supts., E. M. Kelley, Petty's Island, N. J.; C. E. Kinder, Titusville, Pa.
Asst. Supts., A. P. Frame, Petty's Island, N. J.; A. F. Anderson, Titusville, Pa.
Gen. S. M., George W. Hawkins
Tank Car S. M., A. H. Irelan
Station S. M., C. R. Johnson
Ch. Chem., E. F. Burch, Petty's Island, N. J.
Pur. Agt., E. D. Erney
Traf. Mgr., H. P. Ross
Refineries located at Petty's Island, N. J., and Titusville, Pa.

Cross, Henry H., Co., 122 South Michigan Ave., Chicago
Pres., H. H. Cross
V. P., Geo. F. Fox
Sec., L. L. Dent
Mgr. Refg., O. B. Bingham, Smackover, Ark.
Supts., Geo. Hovell, Smackover, Ark.; J. L. McAndrew, Dupo, Ill.; L. W. Johnson, Muskegon, Mich.; W. W. Smedley, Joliet, Ill.
Refineries located at Smackover, Ark.; Dupo, Ill.; Muskegon, Mich., and Joliet, Ill.

Crown Central Petroleum Corp., Pasadena (near Houston), Tex.
Pres., W. A. Williams
V. P.s, M. C. Ehlen, Henry A. Rosenberg
Sec., James T. B. Bowles
Treas., Jacob Blaustein
Supt., Lee LaFerney
Asst. Supt., R. F. Myers
Tank Car and Station S. M., Jesse Stickel
Ch. Egr., C. M. Johnson
Ch. Chem., H. J. Sheard
Pur. Agt., F. A. Pressley
Refinery located at Pasadena (near Houston), Tex.

Crystal Oil Works, Oil City, Pa.
Partners, J. A. Fawcett, E. V. Selden
Gen. Supt., W. B. Graham
Refinery located at Rouseville, Pa.

Cushing Refining & Gasoline Co., Cushing, Okla.
Pres., E. C. Mullendore
V. P., Rex H. Winget
Sec., M. E. James
Treas., R. C. Jones
Gen. Mgr., Rex H. Winget
Supt. Gaso. Plant, C. A. Carlson, Ripley and Blackwell, Okla.
Supts., F. A. Davis, Cushing, Okla.; J. H. Hutchinson, Blackwell, Okla.
Ch. Chem., Melvin Lumly
Pur. Agt., Rex. H. Winget
Traf. Mgr., M. E. James
Tank Car S. M., E. O. Derrick
Refineries located at Cushing, Okla., and Blackwell, Okla.

Cut Bank Refining Co., Cut Bank, Mont. (Partnership)
Partners, R. C. Tarrant and K. H. Davis
Gen. Mgr., K. H. Davis
Refinery located at Cut Bank, Mont.

D

Dale Oil & Refining Co., 412 City National Bank Bldg., Wichita Falls, Tex.
Pres., John E. Kilgore
V. P., Jack B. Dale
Sec. and Treas., Jack B. Dale
Supt., Geo. A. Jennings, Electra, Tex.
Ch. Chem., R. G. Jones
Pur. Agt., Geo. A. Jennings
Refinery located at Electra, Tex.

Danciger Refineries, Inc., Hunt Bldg., Tulsa, Okla.
Pres., Dan Danciger
V. P., Jack Danciger and Joe Danciger
Sec. and Treas., A. Danciger
Gen. Supt., C. M. Johnson
Sales Mgrs., A. F. Boureau and H. B. Niece
Supt., E. C. Roth, Pampa, Tex.
Refineries located at Pampa, Tex., and Longview, Tex.

W. H. Daugherty & Son Refining Co., 88 Lexington Ave., New York (Subsidiary of L. Sonneborn Sons, Inc.)
Pres., Dr. Ferdinand Sonneborn
V. P., J. F. Roten
Sec., R. G. Sonneborn
Treas. and Gen. Mgr., Max Pick
Mgr., T. M. Murphy
Ch. Chem., Dr. F. W. Breth
Refineries located at Petrolia, Pa., and Franklin Creek, Pa.

Deep Rock Oil Corp., Atlas Life Bldg., Tulsa, Okla.
Receiver, Ed H. Moore
Sec., W. R. Francisco
Gen. Supt., W. E. Moody
Supt., Geo. Waltershausen, Cushing, Okla.
Tank Car and Station S. M., B. L. Majewski
Ch. Egr., R. G. Davis, Cushing, Okla.
Ch. Chem., B. Frichot, Cushing, Okla.
Pur. Agt., R. G. Martin
Traf. Mgr., B. J. Burchett, Chicago
Refinery located at Cushing, Okla.

Derby Oil Co., Third and Lawrence, Wichita, Kans.
Pres., A. L. Derby
V. P., E. C. Moriarty
V. P. Chg. Prod., A. S. Ritchie
V. P. Chg. Mfg., F. W. McCurry
Sec., E. Wasser
Treas., E. C. Claiborne
Gen. Mgr., A. L. Derby
Supt., C. R. Black
Cracking Unit Supt., R. L. Crow
Tank Car S. M., C. A. Keller
Station S. M., P. J. Quinlan
Ch. Egr., A. B. Hungerford
Ch. Chem., Geo. N. Webber
Pur. Agt., R. E. Cowen
Traf. Mgr., H. G. Watts
Refinery located at Wichita, Kans.

Dixon Oil & Refining Co., Inc., Jackson, Miss.
Pres., Ed H. Condon
V. P., Earl T. Moor
Sec. and Treas., H. Grady Graham
Gen. Mgr., E. H. Condon
Gen. Supt., W. F. Mitchell
Refinery at Jackson, Miss.

E

Eason Oil Co., Bass Bldg., Enid, Okla.
Pres., T. T. Eason
V. P., L. D. Hinman
Sec. and Treas., T. W. Eason
Gen. Mgr., T. T. Eason
Supt., P. G. Maranville
Tank Car S. M., R. H. Rowland
Station S. M., J. D. Montgomery
Ch. Egr., W. H. Taft
Ch. Chem., G. B. Lyon
Pur. Agt., A. C. Hatton
Traf. Mgr., E. B. Sinclair
Refinery located at Enid, Okla.

East Texas Refining Co., 1405 Tower Petroleum Bldg., Dallas, Tex.
Pres., F. W. Burford
V. P., John J. Thomas
Sec., John R. Scott
Treas., E. V. Campbell
Gen. Supt., John J. Thomas
Asst. Supt., Clarence Watts, Longview, Tex.
Tank Car S. M., L. R. Brammer
Ch. Chem., L. C. Atchison
Pur. Agt., W. M. Bisett
Traf. Mgr., A. L. Heine
Refineries located at Longview, Tex., and Henderson, Tex.

Edington Oil & Refining Co., Ltd., 2800 Cherry Ave., Long Beach, Calif.
Pres., C. B. Edington
Sec., A. C. Edington
Gen. Supt., L. A. Foulger, Long Beach
Ch. Chem., T. A. Rathvon
Refinery located at Long Beach, Calif.

Egasco Operating Co., Box 428, Osage, Wyo.
Pres., Albert E. May
V. P., E. E. Wakeman
Sec. and Asst. Treas., A. F. Lesley
Treas., Harry A. May
Refinery located at Osage, Wyo. Operating part time.

Eldorado Refining Co., Eldorado National Bank Bldg., Eldorado, Kans.
Pres., Charles G. Yankey
V. P., Robert H. Hazlett
Sec., T. A. Helling
Treas., Robert H. Bradford
Gen. Mgr., T. A. Helling
Gen. Supt., G. C. Anderson
Asst. Supt., H. J. Datin
Tank Car S. M., C. W. Rice
Ch. Chem., C. M. Boone
Pur. Agt., O. G. Jackson
Traf. Mgr., R. E. Fisher
Credit Mgr., George J. Peterschmidt
Refinery located at Eldorado, Kans.

Elk Refining Co., Kanawha Valley Bank Bldg., Charleston, W. Va.
Pres., H. A. Logan
V. P. and Treas., F. G. Bannerot
Sec., F. G. Bannerot, Jr.
Gen. Mgr., R. D. Lowe
Supt., Robert Burr, Falling Rock, W. Va.
Asst. Supt., C. J. Hesch, Falling Rock
Tank Car S. M., C. V. Harner
Station S. M., J. W. Wright
Ch. Chem., F. A. Nicholson
Pur. Agt., E. B. Hamilton
Traf. Mgr., L. K. Forthman
Refinery located at Falling Rock, W Va.

Empire Oil & Refining Co., Bartlesville, Okla. (Subsidiary of Cities Service Co.)
Pres., H. L. Doherty
V. P.s, Frank R. Coates, H. R. Straight, H. D. Frueauff, A. W. Ambrose, W. A. Jones
Sec., C. E. Murray
Treas., R. L. Morton, Jr.
Gen. Mgr., P. M. Miskell
Gen. Supt., H. W. Camp
Supts., Edward H. Roy, East Chicago, Ind.; Curtis O. Bailey, Gainesville, Tex.; Don V. Eells, Okmulgee, Okla.; Lee Haugen, Ponca City, Okla.
Tank Car S. M., O. J. Tuttle
Station S. M., C. A. Willis
Ch. Egr., Clay Briggs
Ch. Chem., W. W. Scheumann
Pur. Agt., G. A. Tompson
Traf. Mgr., A. C. Holmes
Refineries located at East Chicago, Ind.; Gainesville, Tex.; Okmulgee, Okla.; Ponca City, Okla.

Estado Petroleum Corp., Ltd., 1315 East Hill St., Long Beach, Calif.
Pres., L. Y. Mattes
V. P., E. E. Greiner
Sec. and Treas., H. Hartsock
Gen. Mgr., L. Y. Mattes
Gen. Supt., E. E. Greiner
Asst. Supt., T. G. Stickels
Sales Mgr., L. Y. Mattes
Ch. Chem., Stanley Blocker
Refinery located at Long Beach, Calif.

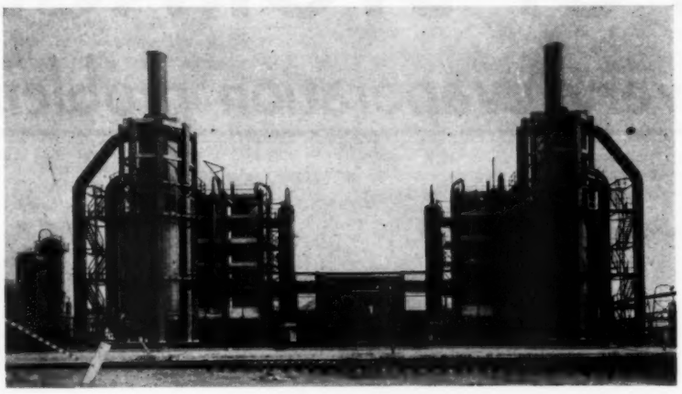
Exchange Petroleum Corp., P. O. Box 817, Albany, Tex.
Pres., A. A. Spencer
V. P., H. E. Roberts
Sec. and Treas., H. A. Spencer
Gen. Mgr., A. A. Spencer
Supt., C. C. White
Tank Car S. M., A. A. Spencer
Pur. Agt., H. E. Roberts
Refinery located at Albany, Tex.

Exeter Refining Co., 5843 Paramount Blvd., Long Beach, Calif.
Pres., C. J. von Bibra
V. P. and Gen. Mgr., W. R. Cowan
Sec. and Treas., E. F. Demond
Gen. Supt., N. F. Gallucci
Sales Mgr., E. F. Demond
Refinery located at North Long Beach, Calif.

F

Falcon Refining Co., Great Bend, Kans.
Pres., Roy Miller
V. P., R. W. Morris
Sec., R. W. Morris
Treas., H. A. Dickason
Gen. Mgr., H. A. Dickason
Gen. Supt., R. H. Miller
Sales Mgr., O. H. Shafer
Ch. Chem., Frank Carpenter

Two Cracking Units Built in Past Year

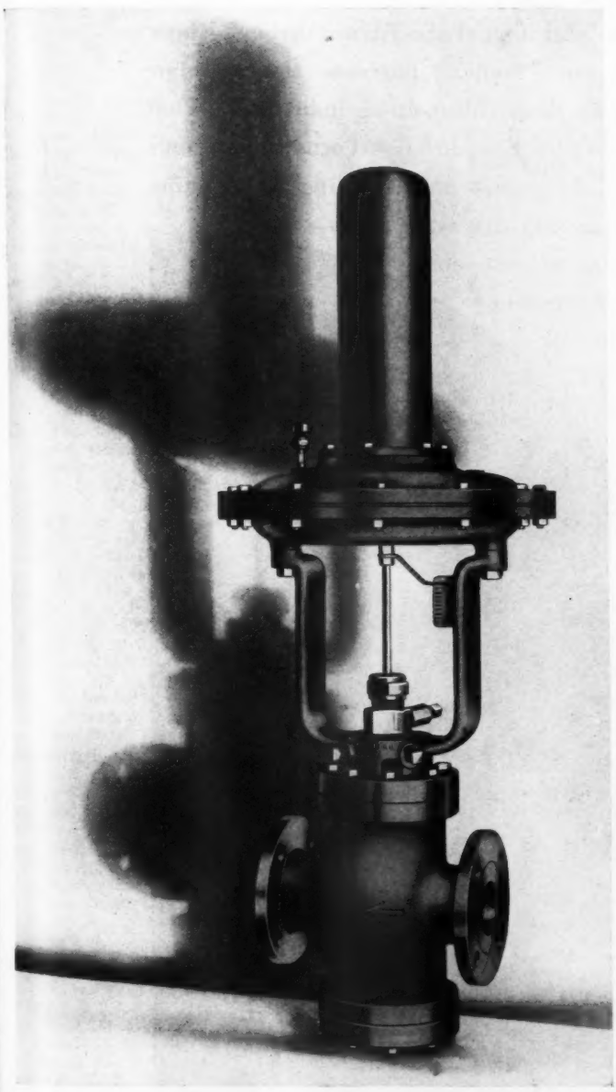


Two new de Florez cracking units in operation at the Lawrenceville, Ill., refinery of the Indian Refining Co.

AGAIN!

FOXBORO Presents a new and outstanding development in Automatic Control . . . . . .

The Stabilflo Valve



This unique valve corrects the common faults of Controlled Valves of the Standard types.

NO FRICTION — By literally turning the motor upside down and suspending the valve stem extension from the top of the spring, all possibility of excess friction is eliminated. No ball or roller bearings are necessary.

GREATER RANGEABILITY — By a radical change in the design of the valve plunger, the flow rangeability has been increased 400% without destroying the essential flow characteristics.

SIMPLE DESIGN — And this has been done without adding any mechanism to the fundamental design of the valve.

This is the only air-operated automatic controlled valve that has complete control of the flow at every point between 2 and 100% of its entire range.

There are *many* other unique features designed into the Stabilflo Valve. It can be furnished for any size line under any pressure or temperature used commercially. Get the complete story of this interesting and valuable valve. Write today—no obligation of course.

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REG. U. S. PAT. OFF.
THE COMPASS OF INDUSTRY

THE FOXBORO COMPANY
FOXBORO, MASS., U. S. A.
BRANCH OFFICES IN PRINCIPAL CITIES

MOST COMPLETE LINE OF INDUSTRIAL PROCESS CONTROL EQUIPMENT

WHO STARTED THIS?

• TUBE-TURNS, Incorporated, is proud to own the distinction of having been by long odds the pioneer of stock fittings for pipe welding. But this fact is important chiefly because of the benefits it brings *to you.* (1) *Proven dependability,* demonstrated by thousands upon thousands of tests in the hard laboratory of actual usage. (2) *Proven correctness* of design, demonstrated by the fact that Tube-Turns, through sheer merit and without benefit of any "feeder" business associates or activities, is still the largest factor in the welding-fitting industry. . . What are these elements of correct design that have made Tube-Turns the nation's choice? (1) *Real* uniformity of wall-thickness—no stretching or thinning of outside walls, no thickening or compressing of inside walls—the outside wall has strength and resistance to corrosion equal to that of the inside wall. (2) Perfect alignment of the fitting with the pipe, to produce faster, better, more economical welding. (3) Uniform radius, or degree or curvature, from face to face—no tangents to reduce the length of the curve. *Hence less pressure loss.* . . These are the three of the several primary features which Tube-Turns alone combine in one supreme fitting—the original stock fitting for pipe welding—the first choice and the last choice of most inquiring buyers. . . Tube-Turns, Incorporated, 403 Herald-Post Building, Louisville, Kentucky.

TUBE-TURNS

Pur. Agt., H. A. Dickason
Traf. Mgr., M. Case
Supt., F. O. Case
Asst. Supt., P. B. Lousignont
Refinery located at Fort Bend, Kans.

Falls Refining Co., Wichita Falls, Tex.
Pres., James E. Parker
V. P., H. T. Parker
Refinery located at Wichita Falls, Tex.

Franklin Creek Refining Corp., 88 Lexington Ave., New York City (Subsidiary of L. Sonneborn Sons, Inc.)
Pres., Dr. Ferdinand Sonneborn
V. P., J. F. Roten
Sec., R. G. Sonneborn
Treas., Max Pick
Gen. Mgr., C. H. Alsberg
Supt., C. H. Goss
Asst. Supt., D. S. Bleakley
Tank Car S. M., C. H. Alsberg
Ch. Chem., T. G. Murphy
Pur. Agt., C. H. Alsberg
Traf. Mgr., G. H. Kingsley
Refinery located at Franklin, Pa.

Franklin, Wirt, Petroleum Corp., Box 966, Ardmore, Okla.
Pres., Wirt Franklin
V. P., F. M. Porter
V. P. and Treas,, Edward Galt
Sec. and Gen. Mgr., F. M. Porter
Gen. Supt., R. L. Johnson
Station S. M., J. S. Entriken
Tank Car S. M. and Pur. Agt., C. A. Franklin
Ch. Chem., Hugh A. Neal
Traf. Mgr., Roy Wade
Refinery located at Ardmore, Okla.

Freedom Oil Works Co., Freedom, Pa.
Pres., Earle M. Craig
V. P., Albert B. Craig
Sec. and Treas., C. E. McKee
Gen. Supt., B. L. Heath
Tank Car S. M., R. B. McKee
Station S. M., E. N. McDonald
Ch. Chem., F. L. Way
Pur. Agt., George J. Mohr
Traf. Mgr., E. W. Niehaus
Refinery located at Freedom, Pa.

G

General Petroleum Corp. of California, Higgins Bldg., Los Angeles, Calif. (Subsidiary of Socony-Vacuum Corp.)
Pres., J. A. Brown
V. P.s, S. J. Dickey, R. A. Sperry, W. L. McLaine
V. P. Chg. of Sales, E. R. Rich
Sec., D. W. Woods
Treas., F. C. Adams
Supt. Ref., Fred Isaacs
Ch. Egr., S. J. Dickey
Ch. Chem., G. F. Olsen
Pur. Agt., R. M. Ketchum
Supt. Pipe Lines, E. L. Adams
Traf. Mgr., C. E. Zeigler
Refineries located at Vernon, Los Angeles, Torrance, Lebec, Olinda (all of California)

Gillette Refining Co., Gillette, Wyo.
Pres., Geo. E. Kiesling
V. P., John W. Selby
Sec. and Treas., L. M. Kiesling
Refinery located at Gillette, Wyo.

Gilmore Oil Co., Ltd., 2423 East Twenty-Eighth St., Los Angeles, Calif.
Pres., E. B. Gilmore
V. P. and Treas., C. S. Beesemyer
V. P. and Sec., S. M. Salisbury
Asst. Secs., J. M. Coates, W. G. Julier, B. A. Rowell
Gen. Supt., H. L. Eggleston
Supt., Perry Vandervort, Santa Maria, Calif.
Asst. Supt., H. E. Marsh
Ch. Chem., R. H. Pierson
Ser. Sta. S. M., B. A. Rowell
Pur. Agt., L. K. Snyder
Traf. Mgr., J. O. Pfeifer
Refineries located at Los Angeles and Orcutt, Calif.

Glasgow Oil & Refining Co., Glasgow, Ky.
Pres., R. B. Tyler
Sec. and Treas., Sewell C. Harlin
Station S. M., J. R. Richey
Refinery located at Glasgow, Ky.

Globe Oil & Refining Co., Box 820, Blackwell, Okla.
Pres., I. A. O'Shaughnessy
V. P., F. L. Jehle
Sec., R. E. Everitt
Treas., E. A. Lentz
Gen. Mgr., F. L. Jehle
Supts., R. D. McCrum, Blackwell, Okla.; H. B. Overton, Lemont, Ill.: O. D. Gurley, McPherson, Kans.
Tank Car S. M., A. E. Landsittel
Asst. Sales Mgr., Brown L. Meece
Ch. Chem., A. L. Gilbert
Traf. Mgr., E. R. Walcher
Pur. Agt., F. L. Jehle.
Refineries located at Blackwell, Okla.; Lemont, Ill., and McPherson, Kans.

Golden Rule Refining Co., Wichita, Kans.
Pres., Elbert S. Rule
Sec. and Treas., W. C. Long
Gen. Mgr., Elbert S. Rule
Supt., J. E. McIntire
Tank Car and Station S. M., W. C. Long
Ch. Chem., O. B. Vanfossen
Pur. Agt., W. C. Long
Refinery located at Wichita, Kans.

Goshen Oil Refining Co., Torrington, Wyo.
Pres., M. A. Eaton
V. P., S. J. Eaton
Sec. and Treas., Irene Eaton
Gen. Supt., E. D. Bishop
Refinery located at Torrington, Wyo.

Gregg Refining Co., Gladewater, Tex.
Owners, Mr. Noble et al.
Refinery located at Gladewater, Tex.

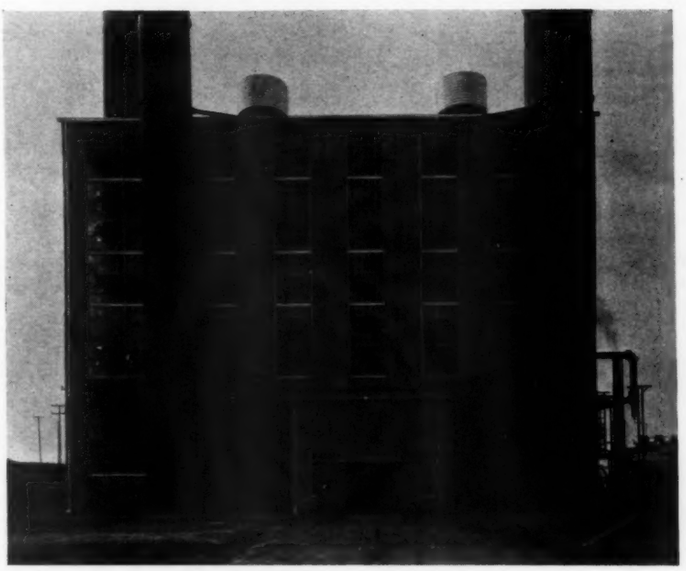
Greenville Refining Co., Inc., Greenville, Ky.
Pres., W. C. Malone
V. P., H. E. Eaves, Sr.
Sec. and Treas., H. E. Eaves, Jr.
Gen. Mgr., B. L. Andrews
Gen. Supt., B. Fortenberry
Ch. Chem., B. Fortenberry
Pur. Agt., H. E. Eaves, Jr.
Refinery located at Greenville (Muhlenberg County), Ky.

Gulf Refining Co., Gulf Bldg., Pittsburgh, Pa.
Pres., J. F. Drake.
V. P.s, Chas. B. Buerger, W. V. Hartmann, J. R. Williams, H. A. Gidney
Sec., W. J. Guthrie
Treas., J. E. Nelson
Gen. Mgr., Geo. L. Prichard
Mgr. Refineries, H. V. Sanderson, Staten Island, N. Y.; L. R. Jones, Philadelphia, Pa.
Supts., Wm. A. Slater, Port Arthur, Tex.; Herman Taylor, Fort Worth, Tex.; R. M. Landon, Sweetwater, Tex.; W. M. Crockett, Philadelphia, Pa.; W. M. Braybrooks, Staten Island, N. Y.; M. J. Ball, Pittsburgh, Pa.; B. H. Barnes, Toledo, Ohio; T. J. Twomey, Cincinnati, Ohio
Asst. Supts., T. J. Sullivan, Port Arthur, Tex.; J. E. Biggins, Philadelphia, Pa.; J. H. Wackenhut, Pittsburgh, Pa.; Thos. F. Hogan, Toledo, Ohio; John W. Schriever, Cincinnati, Ohio.
Mgr. Construction Div., Herbert Henderson
Mgr. Refinery Technology, H. G. Smith
Pur. Agt., C. T. Marsh
Refineries located at Port Arthur, Tex.; Fort Worth, Tex.; Sweetwater, Tex.; Philadelphia, Pa.; Staten Island, N. Y.; Pittsburgh, Pa.; Toledo, Ohio, and Cincinnati, Ohio.

H

Hancock Oil Co. of California, Box 579, Long Beach, Calif.
Pres., W. J. Reid
V. P., Geo. D. Williams.
Sec., W. Reagan
Treas., G. P. Dean
Mgr. Mfg., W. T. Hancock
Supt., H. D. Tupper
Asst. Supt., Jim Edwards

New Modern Refinery Power Plant



Main boiler house at Houston, Tex., refinery of Sinclair Refining Co.

Tank Car S. M., C. B. Limbocker
Station S. M., G. P. McDonnell
Ch. Chem., LaVerne Smith
Pur. Agt., R. Westergard
Refinery located at Long Beach, Calif.

Haskell Oil Refining Corp., Breckenridge, Tex.
Pres., H. P. Downs
Sec., Mrs. Hazel Downs
Tank Car. S. M., H. P. Downs
Refinery located at Breckenridge, Tex.

Home Oil & Refining Co., Great Falls, Mont.
Pres., W. E. Rice
V. P., W. M. Fulton
Sec. and Treas., Fred Erickson
Gen. Mgr., H. O. Batzer
Gen. Supt., Joe Faulkner
Sales Mgr., H. O. Batzer
Pur. Agt., H. O. Batzer
Refinery located at Great Falls, Mont.

Houston Oil Co. of Texas, Petroleum Bldg., Houston, Tex.
V. P. and Treas., L. S. Zimmerman
Sec., A. H. Kennerly
Gen. Mgr., A. W. Standing
Gen. Supts., R. R. Robson, Camden, Ark.; F. Y. Hutchison, Viola, Tex.
Supts., G. H. Hartung, Camden, Ark.; W. R. Hounsell, Viola, Tex.
Tank Car and Sta. S. M., L. H. Sexton.
Pur. Agt., M. L. Clark.
Refineries located at Camden, Ark., and Viola, Tex.

Howard County Refining Co., Big Spring, Tex.
Pres., Robert T. Piner.
V. P., J. E. Bristow
Sec. and Treas., G. H. Hayward
Gen. Mgr., Joseph Edwards
Gen. Supt., V. E. Jackson
Refinery located at Big Spring, Tex.

Humble Oil & Refining Co., Humble Bldg., Houston, Tex. (Subsidiary of Standard Oil Co. of New Jersey)
Pres., R. L. Blaffer
V. P.s, H. C. Wiess, Wallace E. Pratt, John R. Suman, Judge E. E. Townes
Sec., F. O. Freese
Treas., R. L. Blaffer
Gen. Counsel, Judge E. E. Townes
Gen. Mgr. of Ref., J. L. Finley
Ref. Mgr., R. E. Powell, Baytown
Supts., F. N. Reed, Baytown; G. L. Farned, Ingleside; C. M. Bell, San Antonio; C. M. Dennison, Neches
Asst. Supts., C. E. Carlson, M. L. Snyder; W. R. Brison and A. C. Kraft, Baytown; G. P. Curtin, Ingleside
Tank Car S. M., B. H. Brown
Station S. M., S. A. Giraud
Ch. Egr. Ref., Dr. E. F. Voss
Ch. Egr. Prod., W. W. Scott
Ch. Chem., Dr. H. D. Wilde, Jr.
Pur. Agt., J. M. Sitler
Traf. Mgr., J. R. Davis
Refineries located at Baytown, Ingleside, San Antonio, Neches, McCamey, Breckenridge and Chilton

I

Independent Refining Co., Fratt Bldg., Billings, Mont.
Pres., W. E. Rice, Great Falls, Mont.
V. P. and Gen. Mgr., D. E. Hageman
Sec., H. J. Coleman
Treas., F. H. Heitzhausen
Supt., W. D. Manz
Refinery located at Laurel, Mont.

Indian Refining Co., 1 Havoline St., Lawrenceville, Ill. (Subsidiary of the Texas Corp.)
Pres., W. S. S. Rodgers
V. P.s, P. C. Scullin, F. T. Manley, S. B. Wright, H. W. Dodge
Sec., E. M. Crone
Treas., C. E. Woodbridge
Gen. Mgr., P. C. Scullin
Supt., J. S. Worden
Asst. Supt., S. W. Johnson
Tank Car and Station S. M., Walter Hochuli, 5 East Market St., Circle Tower Bldg., Indianapolis, Ind.
Pur. Agt., A. F. Colling, 135 East Forty-second St., New York City.
Refinery located at Lawrenceville, Ill.

J

Jenson Oil Refining Co., 304 Atlas Block, Salt Lake City, Utah
Pres., J. B. Jenson
V. P., Carl Sealanden
Sec. and Treas., Irma M. Jenson
Gen. Mgr., J. B. Jenson
Gen. Supt., W. G. Steornbery
Tank Car and Station Mgr., R. N. Bostwick
Ch. Egr., Ira Packard
Ch. Chem., J. J. Berkeley
Refinery located at Ogden, Utah

Johnson Oil Refining Co., 176 West Adams St., Chicago, Ill.
Pres., I. H. Johnson
V. P., L. Ralph Johnson
Sec., G. C. Lilly
Treas., J. O. Horton
Gen. Supt., L. Ralph Johnson
Supt., W. J. Leenhouts, Cleveland, Okla.
Asst. Supt., R. B. Fowler, Cleveland, Okla.
Tank Car S. M., H. G. Plane
Bulk S. M., H. A. Jones
Station S. M., H. C. Lowry
Ch. Chem., Frank Frey
Pur. Agt., V. C. Goward
Traf. Mgr., G. A. Mindeman
Refinery located at Cleveland, Okla.

Johnsonville Refining Co., Omega, Tex.
Pres., W. B. Mackey
Refinery located at Johnsonville, Tex.

Joplin Refining Co., Box 866, Joplin, Mo.
Pres., A. E. Basinger
V. P., W. F. Maher
Gen. Supt., C. S. Banks
Tank Car and Station S. M., George J. Young
Refinery located at Joplin, Mo.

K

Kanotex Refining Co., Arkansas City, Kans.
Pres., C. M. Boggs
V. P., W. L. Lesh
Sec., E. K. Childers
Treas., R. R. Cox
Supt., F. A. Deering
Asst. Supt., Charles Wakefield
Ch. Chem (plant), Guy S. Kirk
Research Chem., H. L. Lightstone
Pur. Agt., L. E. Watts
Traf. Mgr., C. E. Varner
Refinery located at Arkansas City, Kans.

Kendall Refining Co., Bradford, Pa.
Pres., Otto Koch
V. P.s, H. H. Greene, Joseph H. Bovaird
Sec., J. B. Fisher
Treas., I. H. Shearer
Gen. Mgr., Otto Koch
Asst. Gen. Mgr., H. H. Greene
Ref. Mgr., E. E. Bown
Sales Mgrs., branded oils, I. H. Shearer; light oils, J. B. Fisher; lubricants, H. H. Greene
Sales Mgr., bulk, J. B. Fisher
Ch. Egr., S. M. Wolbert
Ch. Chem., Frank Philippbar
Pur. Agt., J. B. Fisher
Traf. Mgr., James White
Refinery located at Bradford, Pa.

Kilgore Refining Co., Kilgore, Tex.
Pres., J. D. Wrather
V. P., J. R. Wrather
Refinery located at Overton, Tex.

Kolingo Refining Co., Coalinga, Calif.
Refinery located at Coalinga, Calif.

L

Lake Refining Co., Gladewater, Tex.
Management, F. Ferriss, John Kraker, N. Rudman
Refinery located at Gladewater, Tex.

Lake View Oil & Refining Co., 1007 Edwards & Wildey Bldg., Los Angeles, Calif. (Receivership).
Receiver, Paul J. Hisey
V. P., A. J. Rehwold
Sec., Paul J. Hisey
Treas., C. F. Powers
Refinery located at Maricopa, Calif.

LaSalle Petroleum Co., 612 Wright Bldg., Tulsa, Okla.
Receivers, W. J. Schnur, Tulsa, Okla.; Phil D. Williams, Burkburnett, Tex.
Supt., Phil D. Williams, Burkburnett, Tex.
Refinery located at Burkburnett, Tex.

Lincoln Oil Refining Co., Robinson, Ill. (Subsidiary of Ohio Oil Co.)
Pres., H. B. Carpenter
V. P.s, C. L. Fleming, R. E. Luton
Sec., E. B. Redpath
Treas., F. A. Billstone
Gen. Mgr., H. B. Carpenter
Supt., R. E. Luton
Asst. Supt., H. E. Handy
Dir. of Sales, N. T. Stover
Sales Mgr., O. P. Epler
Ch. Chem., T. W. Cutmer
Pur. Agt., C. S. Sherk, Ohio Oil Co., Findlay, Ohio
Traf. Mgr., E. W. Evans, Ohio Oil Co., Findlay, Ohio
Refinery located at Robinson, Ill.

Lion Oil Refining Co., Exchange Bldg., El Dorado, Ark.
Pres., T. H. Barton
V. P.s, T. M. Martin, M. E. Wilson, J. J. Allinson
Sec., Jeff Davis
Treas., R. E. Meinert
Mgr., J. J. Allinson
Supt., J. B. Rogerson
Tank Car S. M., T. M. Martin
Asst. Tank Car S. M., P. G. Anderson
Station S. M., A. F. Reed
Ch. Chem., W. M. Carney
Pur. Agt., R. E. Meinert
Traf. Mgr., P. G. Anderson
Refinery located at El Dorado, Ark.

Locke, D. C., Inc., Gladewater, Tex.
Pres., N. S. Locke
V. P., R. Morrison
Sec., L. E. Winkler
Gen. Supt., Lee Goodson
Refinery located at Gladewater, Tex.

Lotus Refinery (not incorporated), Gladewater, Tex.
Owners, Jack Bell and W. A. Williams
Gen. Supt., Jack Bell
Sales Mgr., W. A. Williams
Refinery located at Gladewater, Tex.

Louisiana Oil Refining Corp., Ardis Bldg., Shreveport, La. (Subsidiary of Cities Service Co.)
Pres., H. L. Doherty
V. P.s, D. W. Harris, W. A. Jones, T. I. Carter
Sec., T. J. Heard
Treas., B. R. Muirhead
Gen. Mgr., D. W. Harris
Gen. Mgr. Ref., R. B. Pierce
Supts., H. R. Smith, Bossier plant; W. F. Dickerson, Gas Center plant
Asst. Supts., G. W. Wilbur, Bossier plant; J. L. Simpson, Gas Center plant
Tank Car S. M., E. F. Brakefield
Gen. Station S. M., J. A. Welch

M

Macmillan Petroleum Corp., 530 West Sixth St., Los Angeles, Calif.
Receivers, R. S. Macmillan, (pres.), R. C. Gillis
V. P.s, H. E. Boner, S. M. Batterson, H. R. Macmillan, M. P. Macmillan
Sec. and Treas., Dewitt Knox
Gen. Supt., H. E. Boner
Supts., C. C. Benz, Long Beach; L. L. Rebber, El Dorado, Ark.
Ch. Chem., S. E. Campbell
Refineries located at Long Beach, Calif, El Dorado, Ark., and Borger, Tex. (Last shut down)

Magnolia Petroleum Co., Magnolia Bldg., Dallas, Tex. (Subsidiary of Socony-Vacuum Corp.)
Chm. Bd., E. R. Brown
Pres., D. A. Little
V. P.s, W. H. Francis, E. E. Plumly, M. J. McLaughlin, E. P. Angus, J. C. Stephens, Ralph H. Kinsloe, Clyde M. Bennett, F. M. Lege, Jr., C. L. Gladden, T. J. Fitch
Sec., L. S. Sinclair
Gen. Mgr., Ralph H. Kinsloe
Gen. Supt., E. E. Plumly
Treas., W. L. Holmes
Supts., C. S. Dickens, Beaumont; W. W. White, Magpetco; John Ricker, Fort Worth No. 1 and No. 2; W. C. Ralston, Corsicana; J. T. Dickens, Luling
Asst. Supts., J. W. Newton and G. E. Plumly, Beaumont; Eugene Ritter, Fort Worth No. 1 and No. 2; N. B. Marchbanks, Luling
Station S. M., E. P. Angus
Ch. Egr., R. G. Sanders
Ch. Chem., W. W. Leach
Pur. Agt., J. P. David
Traf. Mgr., W. M. Maddox
Refineries located at Beaumont, Magpetco, Fort Worth No. 1, Fort Worth No. 2, Corsicana, Luling.

Centralized Control a Reality

Control room for large cracking unit recently completed at Coffeyville, Kans., refinery of Sinclair Refining Co.

Ch. Egr., H. T. Goss
Ch. Chem., A. W. Trusty
Pur. Agt., J. Lucas
Traf. Mgr., E. M. Hinkle
Refineries located at Caddo Parish, La. and Bossier Parish, La.

Louisville Refining Co., Inc., 52 U. S. Trust Bldg., Louisville, Ky.
Pres., Eli H. Brown, Jr.
V. P., J. Fred Miles
Sec. and Treas., H. R. Smith
Gen. Mgr., J. Fred Miles
Asst. Supt., J. J. Loudermill
Tank Car S. M., R. D. Scott
Pur. Agt., W. A. Waples
Traf. Mgr., H. R. Smith
Refinery located at Louisville, Ky.

Lubrite Refining Corp., 3504 Washington Blvd., St. Louis, Mo. (Subsidiary of Socony-Vacuum Corp.)
Pres., H. T. Ashton
V. P., W. H. Ware
Sec., C. E. Werner
Treas., E. J. Glocke
Gen. Mgr., H. T. Ashton
Gen. Supt., D. A. Windsor
Supt., Charles Bettman, East St. Louis, Ill.
Asst. Supt., J. B. Hickey, East St. Louis, Ill.
Tank Car S. M., Earl Whatley
Retail S. M., E. R. Sneed
Ch. Egr., R. A. Frevert
Ch. Chem., L. T. Doiron
Pur. Agt., J. H. MacCrea
Traf. Mgr., O. W. Kuster
Refineries located at East St. Louis, Ill.; Wood River, Ill. (latter indefinitely closed)

Major Petroleum Products Co., Box 1,362 Oklahoma City, Okla.
Pres., W. U. Paul
V. P., E. B. Treadwell
Sec. and Treas., C. B. Warr
Gen. Mgr., W. U. Paul
Gen. Supt., W. O. Leek
Tank Car and Sta. S. M., E. A. Gilmore
Refinery located at Oklahoma City, Okla.

Malco Refineries, Inc., Artesia, N. Mex.
Pres., M. E. Barsh
V. P., L. R. Simon
Sec. and Treas., R. A. Shugart
Ch. Egr. and Ch. Chem., L. R. Simon
Tank Car and Station S. M., R. L. Halley
Pur. Agt. and Traf. Mgr., R. A. Shugart
Refinery located at Artesia, N. Mex.

Marathon Oil Co., Thompson Bldg., Tulsa, Okla. (Subsidiary of Ohio Oil Co)
Pres., W. W. Fleming
V. P.s, L. B. McCammon, C. W. MacKay, R. C. Gwilliam
Sec. and Treas., J. L. Cook
Gen. Supt., A. J. Slagter
Supts., J. R. Barrott, Bristow; W. R. Sonricker, Fort Worth.
Asst. Supts., Joseph Turvey, Bristow; H. L. Megan, Fort Worth
Tank Car S. M., J. V. McCormick
Pur. Agt., W. R. Brown.
Traf. Mgr., W. W. Klingensmith
Refineries located at Bristow, Okla., and Fort Worth, Tex.

Maritime Oil Co., lessee of Deepwater Oil Refineries, Houston, Tex.
Pres., L. F. Rothermel
V. P., M. S. Rothermel
Sec., J. H. Crawford
Treas., L. F. Rothermel
Gen. Supt., L. M. Harper
Tank Car S. M., J. A. McGuire
Refinery located at Houston, Tex.

Master Petroleum Co., 401 Amicable Bldg., Waco, Tex.
Pres., S. J. T. Smith
V. P., R. V. McClain
Sec. and Treas., Floyd Casey
Gen. Supt., Carl Casey
Tank Car S. M., R. L. Seastrunk
Ch. Chem., Carl Casey
Refinery located at Waco, Tex.

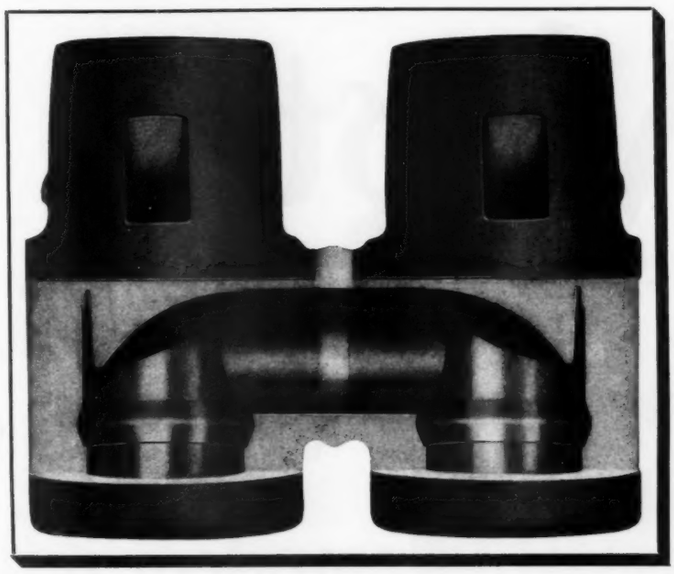
Mentone Oil & Refining Co., Mentone, Tex.
Partners, H. C. Chaddick, E. T. Barker, Jr.
Refinery located at Arno, Tex.

Mid-Continent Petroleum Corp., Cosden Bldg., Tulsa, Okla.
Pres., Jacob France
V. P.s, J. C. Denton, R. W. McDowell, F. B. Koontz, E. M. Rouzer, Geo. Moody.
Sec., E. M. Rouzer
Gen. Mgr., Jacob France
Treas., Charles Klein
Gen. Supt., F. B. Koontz
Asst. Supt., D. G. Morgan
Ch. Chem., H. T. Bennett
Pur. Agt., C. A. Prichard
Sales Mgr., R. W. McDowell
Traf. Mgr., H. W. Roe
Refinery at West Tulsa, Okla.

Middlesex Refining Co., 60 East Forty-second St., New York
Pres., Thomas Graham
V. P., Henry A. Siebrecht
Sec., Thomas C. Meadows
Treas., Louis H. Bean
Gen. Supt., W. Lelgemann
Consulting Egr., Geo. Benhoff
Ch. Egr., Geo. Benhoff
Ch. Chem., W. Lelgemann
Refinery located at New Brunswick, N. J.

Midland Oil Refining Co., 311 Midland Savings Bldg., Denver, Colo.
Pres., L. M. Hines
V. P., Mahlon B. Johnson
Sec. and Treas., L. R. Hines
Gen. Mgr., Bruce Sullivan
Gen. Supt., V. C. Langford
Tank Car S. M., W. C. Williams
Ch. Egr., Howard L. Minister
Ch. Chem., C. Fred Russell
Pur. Agt., Cliff L. Messenger
Traf. Mgr., J. Fred Foley
Refinery located at Brighton Road, Denver, Colo.

Miller, A. D., Sons Co., 1801 Preble Ave., Pittsburgh, Pa.
Pres., J. B. Miller
V. P., A. D. Miller 3d
Sec., O. B. Opsion
Treas., A. D. Miller 3d
Gen. Mgr., J. B. Miller
Gen. Supt., J. B. Miller
Asst. Supt., O. B. Opsion
Tank Car S. M., J. B. Miller
Station S. M., O. B. Opsion
Ch. Egr., W. C. Clowes
Ch. Chem., O. B. Opsion
Pur. Agt., J. B. Miller
Traf. Mgr., O. B. Opsion
Refinery located at Pittsburgh, Pa.



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The body of the Kellogg "Smooth-Flow" return header is composed entirely of forged material with the consequent soundness, toughness and reliability found in a forging.

These headers can be furnished in all standard sizes in the conventional two hole return header, the box-elbow type or the multiple-hole type.

Inquiries should include data regarding furnace tube diameter, operating pressure and temperature, center to center dimensions of tubes and the material preferred.

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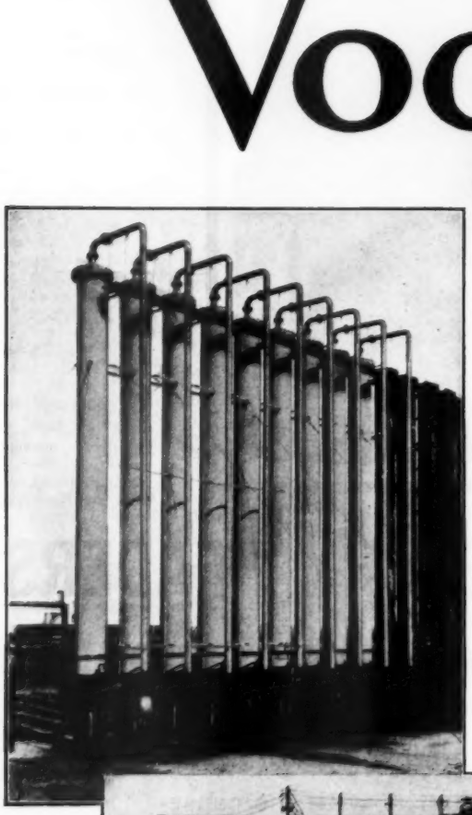
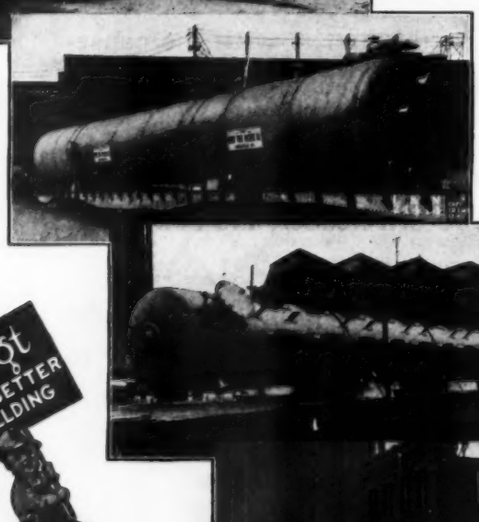
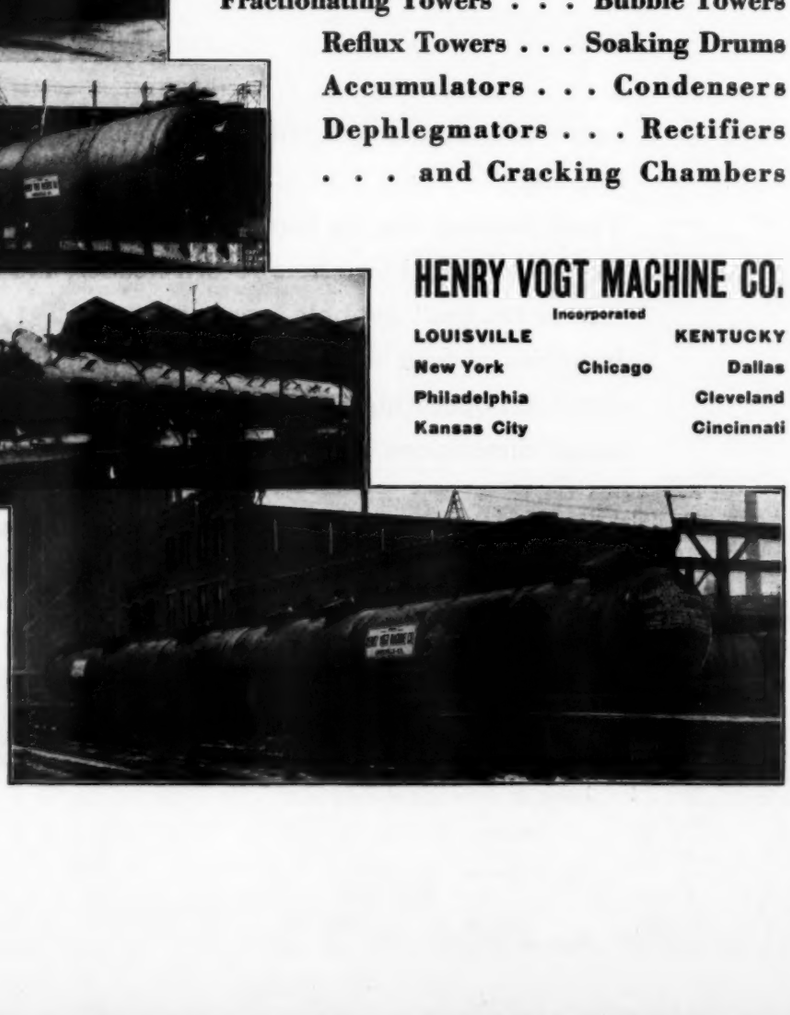
Vogt

HOMOWELD vessels for modern refineries







Pressure Stills . . . Reaction Chambers
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Accumulators . . . Condensers
Dephlegmators . . . Rectifiers
. . . and Cracking Chambers

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LOUISVILLE KENTUCKY
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Manufacturers of: Oil Refinery Equipment, Drop Forged Steel Valves and Fittings, Ice Making and Refrigerating Machinery, Water Tube Boilers, Heat Exchangers.

Misko Refineries, Inc., 1020 Salinas St., Laredo, Tex.
Pres., O. W. Killam
V. P., W. T. Killam
2d V. P., Kent W. Bartlett
Sec., J. O. Garnett
Treas., W. T. Killam
Gen. Mgr., Kent W. Bartlett
Supt., H. E. Reed
Asst. Supt., O. E. Cole
Traf. Mgr., W. T. Killam
Refinery located at Mirando City, Tex.

Mohawk Petroleum Co., 405 Montgomery St., San Francisco, Calif.
Pres., Alfred L. Marsten
V. P., Edwin V. McKenzie
Sec. and Treas., M. E. Roof
Supt., J. A. Robinson, Bakersfield
Refinery located at Bakersfield, Calif.

Monarch Refineries, 820 Detwiler Bldg., Los Angeles, Calif.
Pres., Charles W. Fourl
V. P., W. J. Williams
Sec., L. A. Wagner
Gen. Supt., Frank McGee
Refinery located at Venice, Calif.

Moon Refining Co., Graham, Tex.
Receiver, W. B. Fultz
Refinery located at Graham, Tex.

Mountain States Refining Co., Orchard, Colo.
Pres., E. A. Calkins, Fort Collins
V. P., A. E. Shogren
Sec., S. D. Markley
Treas., E. G. Markley
Supt., C. A. Stewart
Refinery located at Orchard, Colo.

Moutray Oil Co., 602 Pine St., Abilene, Tex.
Pres., E. W. Moutray
V. P., C. B. Snyder
Sec. and Treas., M. P. Moutray.
Gen. Mgr., E. W. Moutray
Gen. Supt., W. W. Moutray
Tank Car and Station S. M., J. P. Bohannon
Refinery located at Hawley, Tex.

Muenster Refining Co., Muenster, Tex.
Owner and Supt., A. G. Hutton
Refinery located at Muenster, Tex.

N

Naph-Sol Refining Co., R.F.D. 3, Muskegon, Mich.
Pres., Walter E. Anderson
V. P., J. F. Helms
Sec. and Treas., A. W. Penny
Gen. Mgr., Walter E. Anderson
Gen. Supt., J. F. Helms
Tank Car S. M., Allen F. Hickey
Ch. Chem., Walter C. Fisher
Pur. Agt., Walter E. Anderson
Traf. Mgr., J. A. Sundquist
Refinery at Muskegon, Mich.

National Refining Co., Hanna Bldg., Cleveland, Ohio
Pres., Frank B. Fretter
V. P.s, C. S. Smith, W. H. Lamprecht
Sec., J. D. Sadler
Treas. and V. P., H. F. Heil
Traf. Mgr., E. E. Harrington
Refineries located at Coffeyville, Kans.; Findlay, Ohio, and Marietta, Ohio

Northwest Stellarene Co., Inc., Shelby, Mont.
V. P.s, James W. Johnson, B. E. Hepler
Sec. and Treas., F. E. Cannon
Supt., Bud Vadnais
Tank Car and Station S. M., James W. Johnson
Ch. Chem., F. W. Eley
Pur. Agt., G. B. Taylor
Refineries located at Shelby, Mont., and Coutts, Alberta

Norwalk Co., 634 South Spring St., Los Angeles, Calif.
Pres., Lionel T. Barneson
V. P., H. J. Barneson
Sec., W. E. Kropp
Gen. Mgr., L. L. Aubert
Supt., Jack Brennan, Maricopa
Pur. Agt., H. M. Paulsen
Refinery located at Maricopa, Calif.

O

Octane Oil Refining Co., Baird, Tex.
Pres., Sylvester Dayson
V. P., J. R. Parten
Sec. and Treas., J. R. Pope
Gen. Mgr., Sylvester Dayson
Gen. Supt., J. L. LeBleu
Pur. Agt., R. P. Hargis
Refinery located at Baird, Tex.

Ohio Valley Refining Co., 201 Barkwill St., St. Mary's, W. Va.
Pres., J. P. Flynn
V. P., H. J. Crawford
Sec. and Treas., W. R. Reitz
Gen. Supt., J. B. Northrop
Tank Car S. M., A. M. Kiester
Traf. Mgr., H. M. Locke
Pur. Agt., J. B. Northrop
Refinery located at St. Mary's W. Va.

Oil Creek Refining Co., Titusville, Pa.
Pres., J. E. Fleming
V. P., F. J. McGraw
Sec., M. D. Woods
Gen. Supt., F. J. McGraw
Treas., G. F. Fleming
Tank Car S. M., M. D. Woods
Pur. Agt., G. L. Ehrhart
Refinery located at East Titusville, Pa.

Old Dutch Refining Co., Box 442, Muskegon, Mich.
Pres., John Borden
V. P., Walter Schuttler
Sec., W. G. Turner, Jr.
Treas., G. B. Treloar
Gen. Mgr., John Borden
Gen. Supt., Everett R. Hively
Tank Car S. M., G. S. Turner, Jr.
Station S. M., G. S. Turner, Jr.
Ch. Egr., Everett R. Hively
Ch. Chem., Clyde A. Cromwell
Pur. Agt., G. B. Treloar
Traf. Mgr., John Dalson
Refinery located at Muskegon, Mich.

Olney Oil & Refining Co., Wichita Falls, Tex.
Pres., Frank Kell
V. P., J. A. Kell
Sec. and Treas., R. G. Cocanower
Gen. Mgr., R. G. Cocanower
Gen. Supt., P. E. Slater
Tank Car S. M., R. G. Cocanower
Refinery located at Olney, Tex.

Olympic Refining Co., 2425 California St., Long Beach, Calif.
Pres. and Gen. Mgr., Charles P. Ritter
Sec. and Treas., D. T. Buckley
Refinery located at Long Beach, Calif.

Omar Refining Co., Roberts Bldg., Tulsa, Okla.
Pres., F. S. Whitaker
V. P., J. H. Whitaker
Sec. and Treas., M. H. Collins
Gen. Supt., H. L. Wilton
Tank Car S. M., J. H. and F. S. Whitaker
Traf. Mgr., V. C. Gibson
Refinery located at Garber, Okla.

Oriental Oil Co., 1911½ Pacific Ave., Dallas, Tex.
Pres., W. R. Smith
V. P. and Gen. Mgr., Frank M. Smith
Sec. and Treas., D. C. White
Gen. Mgr., Frank M. Smith
Gen. Supt., W. T. Evans
Tank Car S. M., B. H. Pitman
Station S. M., M. T. Smith
Ch. Egr., J. D. Scruggs
Ch. Chem., W. T. Evans
Pur. Agt., B. H. Pitman
Traf. Mgr., B. H. Pitman
Refinery located at West Dallas, Tex.

Ouachita Valley Refining Co., P.O. Box 610, El Dorado, Ark.
Pres., John E. Shatford
Sec., E. B. Wall
Treas., C. L. Crenshaw
Gen. Supt., John E. Shatford
Asst. Supt., J. F. White, El Dorado, Ark.
Tank Car S. M., C. L. Crenshaw
Pur. Agt., John E. Shatford
Traf. Mgr., C. L. Crenshaw
Refinery located at El Dorado, Ark.

Overton Refining Co., Overton, Tex.
Pres., J. D. Wrather
V. P., J. R. Wrather
Sec. and Treas., John Wrather
Refinery located at Overton, Tex.

P

Panama Refining Co., Kilgore, Tex.
Pres., Tom Potter
V. P. and Treas., A. Fanding
Sec., W. H. Sanders
Gen. Supt., M. B. Taylor
Tank Car S. M., John E. Stephens
Ch. Chem., J. P. Stepp
Pur. Agt., Tom Potter
Refinery located at Kilgore, Tex.

Pan American Petroleum & Transport Co., 122 East Forty-second St., New York City (Subsidiary of Standard Oil Co. of Indiana).
Chm., E. G. Seubert
V. Chm., E. G. McKeever
Pres., Louis Blaustein
V. P.'s, Jacob Blaustein, J. A. Carroll, Jr., P. H. Harwood, J. S. Wood, C. F. Hatmaker
Sec., D. H. Baker
Treas., J. A. Carroll, Jr.
Gen. Supt., D. J. Smith
Mgr. Texas City plant, P. J. Sweeney
Gen. Supt., Baltimore, Md., plant, H. J. Broderson
Supts., W. W. Hulin, Baltimore, Md.; H. T. Hulin, Savannah, Ga.
Asst. Supt., William Mellendick, Baltimore, Md.
Tank Car and Station S. M., C. F. Hatmaker
Traf. Mgr., J. S. Wood
Pur. Agt., J. A. Whitely
Refineries located at Destrehan, La.; Baltimore, Md.; Savannah, Ga.; Texas City, Tex. (under constr.)

Pan American Southern Corp., Canal Bank Bldg., New Orleans, La.
Pres., E. G. McKeever
V. P.s, A. E. Ralston, J. A. Carroll, Jr.
Sec., D. H. Baker
Treas., J. A. Carroll, Jr.
Gen. Supt., D. J. Smith
Sales Mgr., A. E. Ralston
Ch. Egr., A. M. McKean
Pur. Agt., J. A. Whitely
Traf. Mgr., J. S. Wood
Refinery located at Destrehan, La.

Panhandle Refining Co., Wichita Falls, Tex.
Pres., Roy B. Jones
V. P.s, R. C. Stanford, M. A. Chambers, G. W. Reed
Sec. and Treas., H. F. Bennett
Gen. Mgr., Roy B. Jones
Gen. Supt., W. F. Sims
Ch. Chem., E. W. Ellis
Tank Car and Station S. M., G. W. Reed
Traf. Mgr., J. H. Davenport
Refinery located at Wichita Falls, Tex.

Paraffine Companies, The, Inc., 475 Brannan St., San Francisco, Calif.
Pres., R. S. Shainwald
V. P., W. H. Lowe
Sec., R. Ohea
Treas., R. H. Shainwald
Gen. Mgr., W. H. Lowe
Supt., O. H. Robertson, Emeryville, Calif.
Ch. Egr., J. T. Coleman
Ch. Chem., O. H. Robertson
Pur. Agt., A. H. Silverstone
Traf. Mgr., A. W. Brown
Refinery located at Emeryville, Calif.

Paragon Refining Co., Leuders, Tex.
Pres., J. C. Hester
V. P., J. W. Hampton
Sec. and Treas., J. H. Freeman
Gen. Mgr., J. C. Hester
Gen. Supt., Leon Couts
Sales Mgr., J. C. Hester
Ch. Egr., Leon Couts
Pur. Agt., J. C. Hester
Refinery located at Leuders, Tex.

Paramount Refineries, San Angelo, Tex.
Pres., W. B. Hagan
V. P., H. O'Bannon
Sec. and Treas., C. O. Harris
Supt., Jack Strickler
Asst. Supt., Lee Strickler
Ch. Egr., J. Barnett
Station S. M., Jay Wills
Refinery located at San Angelo, Tex.

Pasotex Petroleum Co., 225 Bush St., San Francisco, Calif.
Pres., K. R. Kingsbury
V. P.s, H. D. Collier, R. W. Hanna, A. S. Russell
Sec., J. H. Tuttle
Treas., V. F. Palmer
Refinery located at El Paso, Tex.

Pecos Diamond Refining Co., Inc., Artesia, N. Mex.
Pres., G. A. Grober
V. P., I. M. Grober
Sec. and Treas., Henry W. Harriman
Gen. Mgr., G. A. Grober
Gen. Supt., G. A. Grober
Ch. Egr. and Chem., Ed Millard
Refinery located at Artesia, N. Mex.

Peninsula Oil Co., Port Clinton, Ohio
Pres., C. W. Underwood
V. P., G. J. Becker
Sec. and Treas., R. L. Seufert
Gen. Mgr., C. W. Underwood
Refinery located at Catawba Island, Ottawa County, Ohio

Pennant Refining Co., Kilgore, Tex.
Owner, H. H. Calloway
Refinery located at Kilgore, Tex.

Pennsylvania Oil Products Refining Co., Warren, Pa.
Pres., M. F. Cowden
V. P., G. E. Muir
Sec., H. E. Lawrence
Treas., D. F. Cowden
Gen. Mgr., M. F. Cowden
Gen. Supt., S. P. Stannard
Tank Car and Station S. M., H. S. Hayden
Refinery located at Eldred, Pa.

Pennsylvania Refining Co., Butler, Pa.
Pres., John A. Beck
V. P.s, A. B. Weingard, W. K. Glenn
Sec. and Treas., Paul R. Beck
Gen. Mgr., W. W. Beck
Supt., G. W. Kirkwood, Karns City, Pa.; Adam Mosher, Titusville, Pa.
Ch. Chem., G. W. Kirkwood
Tank Car S. M., M. H. Hindman
Traf. Mgr., W. S. Schoenfeld
Refineries located at Karn City and Titusville, Pa.

Pennzoil Co., Oil City, Pa.
Pres., C. L. Suhr
V. P., J. F. Vandeventer
Sec., D. J. Cavanaugh
Treas., M. A. Brewster
Gen. Supt., L. D. Fulton
Asst. Supts., J. M. Hinman, Rouseville, Pa.; D. J. Harvey, Oil City, Pa.
Retail S. M., B. S. Phillips
Station S. M., R. A. Browne
Tank Car S. M., E. J. Cavanaugh
Ch. Chem., P. M. Robinson
Pur. Agt., A. W. Clinger
Traf. Mgr., D. W. Carrier
Refineries located at Rouseville, Pa., and Oil City, Pa.

Petrol Corp., 4020 Bandini Blvd., Los Angeles, Calif.
Pres., Edwin W. Pauley
V. P., Harold R. Pauley
Sec., James P. Fitzpatrick
Treas., Percy F. Cartzdafner
Gen. Mgr., Edwin W. Pauley
Gen. Supt., Geo. E. Miller
Gasoline S. M., Wm. A. Burns
Asphalt and Road Oil S. M., W. J. Mintline
Ch. Egr., John N. Hicks
Ch. Chem., Ralph Tarshis
Pur. Agt., Harold R. Pauley
Traf. Mgr., A. S. Hovey
Refinery located at Los Angeles, Calif.

Phillips Petroleum Co., Phillips Bldg., Bartlesville, Okla.
Pres., Frank Phillips
Chm. Exec. Comm., L. E. Phillips
V. P.s, John H. Kane, Clyde Alexander, Wm. N. Davis, C. P. Dimit, H. E. Koopman, J. M. Sands, R. H. Lynn, G. G. Oberfell, H. A. Trower, F. E. Rice, C. R. Musgrave
Gen. Mgr., Clyde Alexander
Sec. and Treas., O. K. Wing
Mgr. of Refineries, M. P. Youker
Supts., Hugh Miller, Borger, Tex.; J. W. Mitchell, Kansas City, Kans.; R. D. Evans, Okmulgee, Okla.
Tank Car and Station S. M., R. C. Jopling
Ch. Egr., A. H. Riney
Refineries located at Borger, Tex.; Kansas City, Kans., and Okmulgee, Okla.
(The Kansas City and Okmulgee refineries are listed as Independent Oil & Gas Co., which is a subsidiary of Phillips Petroleum Co.)

Phoenix Refining Co., Inc., P.O. Box 5055, Dallas, Tex.
Pres., Raymond R. Russell
V. P., Dr. Daniel Russell
Sec., Mrs. R. R. Russell
Gen. Mgr., E. E. Wallace
Supts., J. F. Muense, Dallas; J. H. Hall, Pettus
Refineries located at Dallas and Pettus, Tex.

Pilgrim, Inc., Ardmore, Okla.
Pres., Walter Neustadt
V. P., Max Westheimer
Sec. and Treas., D. W. Neustadt
Gen. Supt., Wm. Chisholm
Refinery located at Kingston, Okla.

Pioneer Oil & Refining Co., 604 Carolina St., San Antonio, Tex.
Pres., A. B. Slimp
Sec. and Treas., M. L. Roark
Tank Car S. M., A. W. Nunn
Refinery located at Somerset, Tex.

Primrose Refining Co., Box 1455, Wichita Falls, Tex.
Pres., H. D. Brin
V. P., S. E. Brin
Sec., E. Garonzik
Treas., H. J. Strief
Gen. Mgr., H. J. Strief
Sales Mgr., H. J. Strief
Gen. Supt., C. J. Gibbs
Traf. Mgr., C. M. Zink
Refinery located at Wichita Falls, Tex.

Producers & Refiners Corp., P.O. Box 449, Independence, Kans. (Controlled by Consolidated Oil Corp.)
Receivers, L. R. Crawford, P. C. Spencer
Disbursing Agt., O. O. Holmgren
Gen. Supt., J. A. Sartori
Supts., John Cutter, Tulsa, Okla.; L. M. Johnston, Parco, Wyo.
Asst. Supts., M. H. Nolan, Tulsa, Okla.; W. R. Newman, Parco, Wyo.
Tank Car Sales Agt., A. T. Smith
Ch. Egr., J. S. Blair, Tulsa
Ch. Chem., Peter Vilkas, Tulsa; A. B. Lort, Parco, Wyo.
Pur. Agt., E. L. Chatfield, Tulsa, Okla.; A. C. Tillman, Parco, Wyo.
Traf. Agt., D. F. McCarthy
Refineries located at Tulsa, Okla.; Parco, Wyo., and Blackwell, Okla. (Latter shut down.)

Producers Oil Co., 1340 Philcade Bldg., Tulsa, Okla.
Pres., Geo. W. Snedden
V. P., M. D. Sanford
Sec. and Treas., G. A. McCulley
Gen. Mgr., M. D. Sanford
Gen. Supt., H. V. Kappel
Tank Car and Station Mgr., I. H. Patton, Jr.
Pur. Agt., M. D. Sanford
Refinery located at Bristow, Okla.

Pure Oil Co., 35 East Wacker Drive, Chicago
Pres., H. M. Dawes
V. P.s, C. B. Watson, R. W. McIlvaine, N. H. Weber, R. Warner, L. S. Wescoat
Sec., L. S. Wescoat
Treas., Rawleigh Warner
Gen. Supt., R. C. Osterstrom, Asst. to C. B. Watson
Supts., K. B. May, Midland, Mich.; E. E. McPherson, Heath, Ohio; J. R. Palmer, Cabin Creek, W. Va.; R. E. Young, Muskogee, Okla.; R. L. Vernor, Smith's Bluff, Tex.; E. A. McCadden, Marcus Hook, Pa.; O. B. Wendeln, Toledo, Ohio
Asst. Supts.. E. A. Clarke, Midland, Mich.; J. C. Megraw, Cabin Creek, W. Va.; G. T. Yost, Muskogee, Okla.; J. S. Allen, Smith's Bluff, Tex.; J. G. Grace, Marcus Hook, Pa.; H. L. Smith, Toledo, Ohio
Tank Car S. M., R. H. McElroy
Station S. M., G. C. Morris
Ch. Egr., D. E. Sullivan
Ch. Chem., C. R. Wagner
Pur. Agt., G. L. Parsons
Traf. Mgr., H. Hauseman
Refineries located at Midland, Mich.; Heath, Ohio; Cabin Creek, W. Va.; Muskogee, Okla.; Smith's Bluff, Tex.; Marcus Hook, Pa., and Toledo, Ohio

Q

Quaker State Refining Corp., Chambers Bldg., Oil City, Pa.
Pres., H. J. Crawford
V. P.s, S. Messer, James D. Berry
Sec. and Asst. Treas., W. R. Reitz
Treas. and Asst. Sec., Charles D. Berry
Gen. Supt., G. B. Hunter
Supts., A. R. Newton, Jr., Emlenton, Pa.; K. B. Ogilvie, Farmers Valley, Pa.
Refineries located at Emlenton, Pa.; Farmers Valley, Pa.

R

Raven Oil & Refining Co., Rangely, Colo.
Pres., J. W. Leonard
V. P., F. G. Cary
Sec. and Treas., R. A. Bryson
Gen. Mgr., R. A. Bryson
Gen. Supt., M. M. Cook
Pur. Agt., R. A. Bryson
Refinery located at Rangely, Colo. (Products marketed by Continental Oil Co.)

Red Ball Refining Co., Hunt Bldg., Tulsa, Okla. (Subsidiary Danciger Refineries, Inc.)
Same officers as Danciger Refineries, Inc.
Refinery located at Pampa, Tex.

Red River Refining Co., Inc., 77 West Washington St., Chicago, Ill.
Pres., P. B. Flynn
V. P., J. P. Goodrich
Sec. and Treas., E. F. Buchanan
Supt., C. A. Harris, Burnham, Ill.
Refinery located at Burnham, Ill.

Republic Oil Refining Co., 221 Fourth Ave., Pittsburgh, Pa.
Pres., O. D. Robinson
V. P.s, J. O. Corner, D. W. Hovey
Sec. and Treas., W. H. Moreland
Gen. Mgr., J. O. Corner
Supt., D. W. Hovey, Texas City, Tex.
Asst. Supt., C. E. Robertson
Traf. Mgr., O. R. Eytel
Tank Car S. M., J. O. Corner
Refinery located at Texas City, Tex.

Richfield Oil Co. of California, Richfield Bldg., Los Angeles, Calif.
Receiver, William C. McDuffie
Gen. Supt., A. M. Kelley
Supt., R. A. Panero, Wilmington, Los Angeles County, Calif.
Gen. Sales Mgr., R. W. Walsh
Ch. Egr., David E. Day
Ch. Chem., C. K. Hewes
Pur. Agt., B. J. Mahaffy
Traf. Mgr., W. O. Narry
Refineries—Watson refinery, Hynes refinery, Los Angeles, Bakersfield (the two latter shut down)

Rio Grande Oil Co., 417 South Hill St., Los Angeles, Calif. (Controlled by Consolidated Oil Corp.)
V. P.s, C. S. Jones, Frank A. Morgan
Sec. and Treas., M. R. Gross
Gen. Supt., J. J. Downey
Ch. Egr., J. J. Downey
Supt., D. H. Driscoll, El Paso, Tex.; L. D. Frizzell, Phoenix, Ariz.; William Murray, Los Angeles, Calif.
Tank Car and Station S. M., J. N. Reed
Pur. Agt., H. H. Kelly
Refineries located at South Gate, Calif.; El Paso, Tex.; Phoenix, Ariz. (South Gate and Phoenix plants shut down)

River Dome Refinery, 724 First St., East, Round Up, Mont.
Pres., L. R. Carroll
V. P., S. A. Grouse
Sec., H. J. Carroll
Treas., L. R. Carroll
Supt. Ref., L. R. Carroll
Refinery located at Round Up, Mont.

Rock Island Refining Co., Oklahoma Bank Bldg., Duncan, Okla.
Pres., L. B. Simmons
V. P., R. H. Brown
Sec. and Treas., J. C. Maloney
Gen. Mgr., L. B. Simmons
Supt., A. L. Rayburn, Beckett, Okla.
Asst. Supt., A. R. Love, Beckett
Tank Car S. M., E. J. Glover
Ch. Egr., Emory M. Skinner
Ch. Chem., C. V. May
Pur. Agt. and Traf. Mgr., R. H. Roper
Refinery located at Beckett, Okla.

Roosevelt Oil Co., P. O. Box 168, Mount Pleasant, Mich.
Pres., C. L. Maguire
V. P., T. F. Caldwell
Sec. and Treas., S. M. Fasquelle
Gen. Mgr., C. L. Maguire
Supt., Robert Williams
Asst. Supt., D. Y. Hewitt
Station S. M., Moody Steel
Tank Car S. M., T. F. Caldwell
Asst. Tank Car S. M., L. V. Throop
Ch. Chem., G. Hobson
Pur. Agt., J. W. C. McKee
Traf. Mgr., E. Brewster
Refinery located at Mount Pleasant. Mich.

Root Refining Co., 1000 Commercial Bank Bldg., Shreveport, La.
Pres., D. P. Hamilton
V. P., Horace Canon
Sec., T. E. Beaird
Treas., L. C. Hallonquist
Gen Mgr., D. P. Hamilton
Supt., Ed Kimes, El Dorado, Ark.
Asst. Supt., John Brown, El Dorado
Tank Car S. M., D. A. Brown
Ch. Egr., R. T. Colquette
Ch. Chem., T. L. MacNamara
Pur. Agt., T. E. Beaird
Traf. Mgr., A. L. Aycock
Refinery located at El Dorado, Ark.

Rusk Refining Co., Box 165, Overton, Tex.
Pres., H. H. Coffield, Rockdale, Tex.
V. P. and Gen. Mgr., George P. Mann, Dallas, Tex.
Sec. and Treas., J. H. Edwards, Tyler, Tex.
Sales Mgr., J. H. Edwards
Refinery located at Overton, Tex.

Russell Oil Co., 642 Utah Ave., Billings, Mont.
Pres., Joseph Russell
Sec. and Treas., Mrs. Anna Russell
Gen. Mgr., W. J. Thomas
Gen. Supt. and Pur. Agt., Hugh H. Sargent
Supts., W. S. Duncan, Butte, Mont.; Mike Hoyem, Billings
Asst. Supts., John Hoen, Butte; Abner Kolstead, Billings
Tank Car S. M., W. J. Thomas
Station S. M., Glenn Faus
Ch. Egr., Louis Simonich
Ch. Chem., William Negherbon
Refineries located at Butte and Billings, Mont.

S

San Fernando Refining Co., Box I, San Fernando, Calif.
Pres., Joseph Moffett
Refinery located at Newhall, Calif.

St. Helens Petroleum Co., Ltd., 1026 Western Pacific Bldg., Los Angeles, Calif.
Chm., Charles B. Stocken
Directors, William Ivey, A. F. Strickland, G. W. Ivey
Secs., R. H. Young, L. A. Secretary, A. P. McEchern
Gen. Mgr., Charles Drader
Supt., C. Z. Webb., Pico, Calif.
Asst. Supt., G. W. Spark, Pico, Calif.
Tank Car and Station S. M., C. N. Collins
Ch. Egr. and Ch. Chem., C. W. Spark
Pur. Agt., H. C. Drader
Traf. Mgr., R. M. Kennett
Refinery located at Pico, Calif. Main office, Kern House, London, England

Seaside Oil Co., Summerland, Calif.
Pres., A. M. Heineman
V. P., J. F. Bushnell
Sec., M. W. O'Brien
Gen. Supt., D. C. Peet
Station S. M., Winslow Bushnell
Pur. Agt., E. H. Beresford
Refineries located at Ventura and Summerland, Calif.

Security Petroleum Co., Security Bldg., Kansas City, Mo.
Ch. of Bd., C. C. Nelson
Pres., Edwin F. Borgolte
V. P., Earle W. Jennings
Sec. and Treas., Richard R. Nelson
Gen. Supt., Roscoe A. Fox
Sales Mgr., Edwin F. Borgolte
Ch. Egr., Roscoe A. Fox
Ch. Chem., Roscoe D. Howard
Pur. Agt., Earle W. Jennings
Traf. Mgr., S. A. Smith
Refinery located at Chase, Kans.

Shamrock Oil & Gas Co., 602 Amarillo Bldg., Amarillo, Tex.
Pres., John J. Sherrin
V. P., H. C. Fownes II
Sec., W. E. Motheral
Treas., J. B. Orr
Gen. Supt., W. F. Cereghino
Tank Car and Station S. M., N. E. Schneider
Refinery located at Sunray, Tex.

Shell Oil Co., 100 Bush St., San Francisco, Calif. (Subsidiary of Shell Union Oil Co.)
Pres., G. Legh-Jones
V. P.s, E. F. Davis, S. Belither, E. L. Miller, J. U. Stair, D. Heggie, A. E. Lacomble
Sec., A. R. Bradley
Treas., D. Heggie
V. P. in Chg. Ref., A. E. LaComble
Supts., D. M. Day, Martinez and Coalinga, Calif.; C. O. F. Jenkin, Wilmington and Dominguez, Calif.
Asst. Supts., A. H. Calderwood, Martinez and Coalinga, Calif.; I. M. Hemphill, Wilmington; W. S. Nix, Dominguez, Calif.
V. P. Chg. Local Sales., E. L. Miller
Ch. Egr., N. W. Thompson
Ch. Technologist, A. G. Marshall
Pur. Agt., J. C. Storey
Traf. Mgr., C. E. Donaldson
Refineries located at Martinez, Coalinga, Wilmington and Dominguez, Calif.

Shell Petroleum Corp., Shell Bldg., St. Louis, Mo. (Subsidiary of Shell Union Oil Corp.)
Pres., Alexander Fraser
V. P.s, Richard Airey, H. H. Anderson, G. S. Rollin, T. E. Swigart, J. W. Watson, R. P. Bascom
V. P. Exploration, W. van Holst Pellekaan
V. P. Sales, L. Van Eeghen
V. P. Mfg., J. F. M. Taylor
Sec., P. R. Chenoweth
Treas., J. W. Watson
Mgr. of Ref., R. B. High
Supts., E. H. Schippers, Wood River, Ill.; R. H. Waser, East Chicago, Ind.; W. Mullemeister, Houston, Tex.; R. C. Roberts, Arkansas City, Kans.; P. E. Foster, Norco, La.
Asst. Supts., H. A. Stiles, Wood River, Ill.; J. L. Miller, East Chicago, Ind.; T. G. Elder, Houston, Tex.; P. E. Hurley, Arkansas City, Kans.; W. G. Horstmann, Norco, La.
Tank Car S. M., R. D. Ebbert
Bulk Depots S. M., D. G. Coombs
Station S. M., N. E. Hall
Ch. Egr., S. Peterson
Ch. Chems., E. G. Travis, Wood River; E. B. Ayers, East Chicago; S. H. Morgan, Norco; R. C. Rich, Houston; L. C. Burroughs, Arkansas City.
Pur. Agt., C. B. Singleton
Traf. Mgr., E. W. Sieboldt
Refineries located at Wood River, Ill.; East Chicago, Ind.; Houston, Tex.; Arkansas City, Kans., and Norco, La.

Sherwood Refining Co., Bush Terminal, Brooklyn, N. Y.
Pres., H. H. Sherwood
V. P., H. H. Watkins
Sec., James W. Jackson
Treas., G. D'Amore
Gen. Mgr., H. H. Sherwood
Supt., Elmer Peters, Warren, Pa.
Tank Car S. M., Wm. F. Kroneman
Ch. Chem., Arthur J. Franks
Pur. Agt., H. H. Sherwood
Refinery located at Warren, Pa.

Simms Oil Co., 1007 Magnolia Bldg., Dallas, Tex.
Pres., Edward T. Moore
V. P., F. R. Schneider
Sec., L. W. Richards
Treas., D. H. Voss
Gen. Mgr., Edw. T. Moore
Gen. Supt., I. H. Lantz
Supt., A. G. Davis, Smackover, Ark.
Tank Car S. M., H. W. Coleman
Station S. M., Geo. D. Bowers
Ch. Egr., Frank Gardner
Ch. Chem., H. L. Kerr
Pur. Agt., W. J. Morrison
Traf. Mgr., J. W. Ricker
Refineries located at Dallas, Tex., and Smackover, Ark.

Signal Oil & Gas Co., 811 West Seventh St., Los Angeles, Calif.
Pres., S. B. Mosher
Refinery located at Hynes, Calif.

Simrall Refining Corp., 511 Union Central Bldg., Cincinnati, Ohio
Pres., W. F. Simrall
V. P., R. P. Crothers
Sec. and Treas., A. A. Buschle
Gen. Mgr., W. F. Simrall
Ch. Egr., R. P. Crothers

USS

PLYKROME

can be welded

. . . or hot formed

without subsequent heat treatment

For those articles in which heat treatment is difficult or impossible after fabrication, USS Plykrome is ideally suited. Its corrosion-proof surface is of Stabilized USS 18-8 Stainless Steel. This special stainless resists intergranular attack even under the most severely corrosive conditions.

As a consequence Plykrome can be welded successfully or subjected to high temperatures during fabrication or service without loss of its corrosion-resistant qualities. Furthermore, the stabilizing treatment given to Plykrome to insure its resistance to corrosion is such that the steel backing is put into the best possible condition for forming. This unique quality makes Plykrome a practical metal for many applications which cannot employ unstabilized stainless steel.

Additional information on the use of Plykrome in specified installations may be had upon request.

A striking indication of the difference between ordinary 18-8 stainless and the stabilized 18-8 used as the surface veneer on USS Plykrome. Here a piece of low carbon USS 18-8 (on the left) has been welded to USS Stabilized 18-8 (on the right) and subsequently put in an acid bath. Note the manner in which the unstabilized steel has been corroded adjacent to the weld. The stabilized stainless, however, is entirely free from attack.

USS STEEL

Illinois Steel Company

208 S. LA SALLE STREET, CHICAGO, ILL.

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

U S S CHROMIUM-NICKEL ALLOY STEELS ARE PRODUCED UNDER LICENSES OF THE CHEMICAL FOUNDATION, INC., NEW YORK, AND FRIED. KRUPP A. G. OF GERMANY

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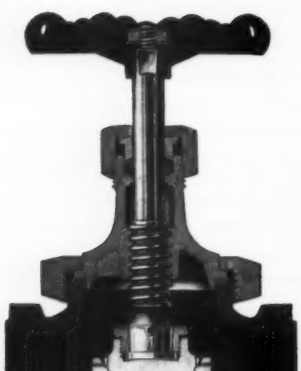
"FERRENEWO" and "RENEWO" VALVES

for Throttling and other Severe Service



Iron Body "Ferrenewo"
Fig. 1021-P, 150 lb. SP.

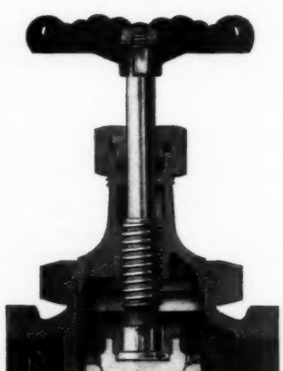
Developed primarily for throttling, drain and other severe service, "Ferrenewo" and "Renewo" Valves with Plug Type "NS5" Alloy Seats and Discs are now available.

"NS5" alloy (patent applied for) is a new and exclusive Lunkenheimer research development. It is a non-galling, non-ferrous composition of great hardness (300 Brinell); resistant to wear, abrasion, erosion and corrosion, and retains its hardness at high temperatures.

Plug Type Valves are made with full length, deep seated plugs. Each plug is ground into its own seat, to a uniform bearing from end to end.

INTERCHANGEABLE PARTS

Excepting bodies and bonnet rings, all parts of "Ferrenewo" and medium "Renewo" Valves are interchangeable—hence it is necessary to carry but one stock of parts for both valves. This interchangeability feature likewise applies to extra Heavy "Renewo" patterns.



Bronze "Renewo"
Fig. 73-P, 200 lb. SP.
Fig. 16-P, 300 lb. SP.

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LUNKENHEIMER VALVES

102-68P-91

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Supt., E. H. Crawley, Horse Cave, Ky.
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V. Chm. Bd., H. R. Gallagher
Pres., E. W. Sinclair
Asst. to Pres., Daniel J. Pierce
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Sec., A. Steinmetz
Treas., J. F. Farrell
V. P. Chg. Ref., George H. Taber, Jr.
Ch. Egr., J. S. Hess
Ch. Chem., E. B. Phillips
Pur. Agt., H. B. Malone
Traf. Mgr., J. M. O'Day
Tank Car and Sta. S. M., J. W. Carnes
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Sec. and Treas., F. T. Hopp
Gen. Mgr., W. G. Skelly
Gen. Supt., Emby Kaye
Supt., K. J. Smith, Eldorado, Kans.
Asst. Supt., H. V. Smith, Eldorado.
Ch. Egr., Arthur Ayvazian
Ch. Chem., E. A. Todd
Pur. Agt., F. W. Robertson
Traf. Mgr., A. F. Winn
Tank Car and Sta. S. M., John R. Bailey
Mgr. Research Dept., R. W. Leslie
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V. P.s, W. J. Sloan, P. H. Zook
Sec., C. T. Rickerson
Treas., W. J. Sloan
Gen. Mgr., Paul H. Zook
Gen. Supt., Paul Tinkler
Asst. Supt., Earl Dorrance
Sales Mgr., J. J. Fox
Pur. Agt., George Bennett
Traf. Mgr., Walter Murphey
Refinery located at Warren, Pa.

Snow Cap Oil Co., Sunburst, Mont.
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V. P., Edward F. Eulberg
Sec. and Treas, B. A. Eulberg
Gen. Mgr., Adam J. Eulberg
Refinery located at Sunburst, Mont.

Socal Oil & Refining Co., 1002 Rowan Bldg., Los Angeles, Calif.
Pres., J. H. Grimes
Sec., M. C. Hallicy
Supt., J. H. Grimes
Sales Mgr., F. M. Moore
Refinery located at Huntington Beach, Calif.

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V. P., J. G. Gray
Sec., N. L. Webster
Treas., C. E. McKay
Gen. Mgr., L. H. Gray
Supt., C. L. Harriman, Reeds, Tex.
Tank Car and Station S. M., N. L. Webster
Ch. Egr., C. L. Harriman
Ch. Chem., Lance Swift
Traf. Mgr., R. F. Coorpender
Pur. Agt., N. L. Webster
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V. P., H. B. Wood
Sec. and Treas., Earl R. Tate
Gen. Supt., Dexter Parmley
Tank Car S. M., A. R. Anderson
Station S. M., L. I. Longsworth
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Ch. Egr., D. L. Edmonson
Ch. Chem., H. O. Sivess
Pur. Agt., M. W. Bass
Traf. Mgr., F. H. Walker
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V. P.s, W. H. Berg, Oscar Sutro, R. W. Hanna, H. D. Collier
Sec., J. H. Tuttle
Treas., V. F. Palmer
Gen. Supt., A. F. Brooks
Supts., H. C. Hanna, El Segundo; C. F. Finney, Richmond; J. F. Faber, Bakersfield
Ch. Egr., H. H. Hall
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Traf. Mgr., A. R. Slingerland
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Treas., C. J. Barkdull
Gen. Mgr. Sales, Amos Ball
Gen. Mgr. Mfg., M. G. Paullus
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Supts., O. E. Bransky, Whiting, Ind.; C. B. Manbeck, Wood River, Ill.; G. H. Moffett, Sugar Creek, Mo.; H. R. Snow, Neodesha, Kans.; R. E. Beard, Casper, Greybull and Laramie, Wyo.
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V. P. and Gen. Mgr. Sales, J. E. Skehan
V. P. and Gen. Mgr. Mfg., H. H. Hewetson, Baton Rouge
Gen. Supt., M. J. Rathbone, Baton Rouge
Refinery located at Baton Rouge, La.

Standard Oil Co. of New Jersey, 26 Broadway, New York City, N. Y.
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Pur. Agt., J. W. Casterton
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V. P.s, John A. Brown, William B. Walker, Arthur F. Corwin, Frederic Ewing
Sec., Henry Fisher
Treas., Richard P. Tinsley
Gen. Supt., Wilbur F. Burt
Supts., A. E. Esser, Sone & Fleming, Brooklyn; R. B. Malone, Pratt Works, Long Island City; R. T. Lockwood, Buffalo Refinery; C. W. Schaffer, Providence Refinery
Asst. Supts., W. J. Mooney and F. W. Hadley, Sone & Fleming, Brooklyn; J. C. Allen, Pratt Works, Long Island City; F. S. Ford, Buffalo; H. A. Rickett, Providence
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Standard Oil Co. of Ohio, Sixteenth Floor, Midland Bldg., Cleveland, Ohio.
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Sec., F. H. Kelly
Treas., W. J. Semple
Gen. Mgr., W. T. Holliday
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Supts., A. H. Buchanan, Cleveland; G. W. Hannekin, Toledo; E. A. Brown, Latonia, Ky.; J. R. Cuthbert, Solar Refinery, Lima, Ohio
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Station S. M., A. A. Stambaugh
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Ch. Chem., Dr. R. E. Burk
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Sec. and Treas., F. J. Keleher
Gen. Supt., O. W. White, Superior, La.
Ch. Egr., G. S. Bays
Pur. Agt., W. L. James
Tank Car S. M. and Traf. Mgr., F. J. Keleher
Refinery located at Superior, La.

Starlight Refinery Co., Karns City, Pa.
Pres., F. J. Pickard
V. P., W. B. Purvis
Sec., Howard I. Painter
Tres. and Gen. Supt., Clyde E. Pickard

Gen. Mgr., F. J. Pickard
Refinery located at Karns City, Pa.

Star Refinery, Osage, Wyo.
Gen. Mgr., Gretchen G. Ross
Refinery located at Osage, Wyo.

Star Refining & Producing Co., Fort Worth, Tex.
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V. P., Herman Gartner
Sec. and Treas., Clara Mabry
Gen. Mgr., W. M. Harrison
Gen. Supt., Joe King
Tank Car and Station S. M., H. Atherton
Refinery located at Fort Worth, Tex.

Steiner, Louis, Long Beach, Calif.
Refinery located at Long Beach, Calif.

Steiner Refining Co., 2204 South St., Long Beach, Calif.
Refinery located at Long Beach, Calif.

Stellar Refining Co., Newark, Ohio.
Mgr. and Supt., V. Buchanan
Refinery located at Marne, near Newark, Ohio

Stoll Oil Refining Co., Inc., Louisville, Ky.
Pres., C. C. Stoll
V. P. Chg. Sales, Geo. Stoll
V. P. Chg. Ref., Berry V. Stoll
V. P. Chg. Stations, Chas. E. Stoll
Sec. and Treas., Wm. A. Stoll
Comptroller, Albert S. Prinz
Supt., J. W. Kittner
Asst. Supt., Covington Arteburn
Tank Car S. M., J. J. Kirchner
Ch. Chem., Clem S. Luce
Traf. Mgr., Geo. E. Gill
Refinery located at Louisville, Ky.

Stone Oil Co., Second National Bank Bldg., Houston, Tex.
Pres, R. W. Stone
V. P., H. M. Stone
Sec. and Treas., Adelaide La Combe
Refinery located at Texas City, Tex.

Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
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V. P.s, J. N. Pew, Jr., J. Edgar Pew, S. B. Eckert, A. E. Pew, Jr.
Sec. and Treas., Frank H. Cross
Supts., W. D. Mason, Marcus Hook, Pa.; H. O. Cameron, Toledo, Ohio; C. B. Carter, Yale, Okla.
V. P. Chg. Sales, S. S. Eckert
Ch. Chem., Dr. Gellert Alleman
Pur. Agt., W. H. Booth
Refineries located at Marcus Hook, Pa.; Toledo, Ohio, and Yale, Okla.

Sunray Oil Co., Philcade Bldg., Tulsa, Okla.
Receiver, C. H. Wright
Gen. Mgr., C. H. Wright (Receiver)
Gen. Supt. Ref., A. D. Vinson
Sales Mgr., F. L. Martin
Bulk Station S. M., J. G. Wright
Ch. Chem., Billy Fairfield
Pur. Agt. and Traf. Mgr., F. L. Martin
Tank Car S. M., F. L. Martin
Refinery located at Allen, Okla.

Sunset Pacific Oil Co. (a Delaware Corp.), Pacific Electric Bldg., Los Angeles, Calif.
Receiver, F. H. Rolapp
Pres., H. L. Carnahan
Refinery located at 2,435 East Vernon Ave., Vernon, Calif.

Superior Oil Works, Warren, Pa.
Pres. R. Z. Morrison
V. P., F. C. Eaton
Sec. and Treas., H. G. Eaton
Supt., H. S. Peterson
Tank Car S. M., H. G. Eaton
Asst. Tank Car S. M., H. T. Cogswell
Ch. Chem., R. B. Allmendinger
Refinery located at Warren, Pa.

Superoil Co., Tiffin & Weaver Sts., Toledo, Ohio
Pres., R. R. Adams
V. P., T. E. Keen
Sec. and Treas., C. L. Hopkins
Gen. Supt., J. J. Curran
Asst. Supt., L. Curran
Refinery located at Toledo, Ohio

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Taxman Refining Co., Inc., Wichita Falls, Tex.
Pres., J. J. Taxman
V. P., Maynard Taxman
Gen. Supt., J. C. Hinds
Station S. M., E. S. Taxman
Pur. Agt. and Traf. Mgr., C. W. Hulland
Refinery located at Wichita Falls, Tex.

Taylor Refining Co., Taylor, Tex.
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V. P., C. W. Cahoon, Jr.
Sec., Harris A. Melaskey
Treas., Ben H. Harrison
Gen. Mgr., G. L. Rowsey
Supts., J. B. Mayo, Taylor, Tex.; J. F. Whitehurst, Tyler, Tex.
Station S. M., C. A. Neal
Tank Car S. M., C. W. Cahoon, Jr.
Ch. Egr., B. H. Perkinson, Tyler; J. B. Mayo, Taylor
Ch. Chem., V. E. Crawford, Tyler
Traf. Mgr., H. B. Cole
Pur. Agt., Ben H. Harrison
Refineries located at Taylor and Tyler, Tex.

Texas Co., The (California), 929 South Broadway, Los Angeles, Calif.
Chm. Bd., C. B. Ames
Pres. and Gen. Mgr., C. E. Olmsted, Los Angeles
V. P.s, J. A. Bermingham, Los Angeles; R. T. Herndon, Los Angeles; L. R. Holmes, Los Angeles; H. W. Dodge, New York.
Sec., E. M. Crone, New York.
Treas., C. E. Woodbridge, New York
Mgr. Ref., L. R. Holmes, Los Angeles
Supts., W. J. Ryan, Los Angeles; J. R. Scanlin, Fillmore, Calif.
Mgr. Sales Dept., R. T. Herndon, Los Angeles
Pur. Agt., A. F. Colling, New York
Refineries located at Los Angeles, Calif.; Fillmore, Calif., and Coalinga, Calif. (Last shut down.)

Texas Co., The (Delaware), 135 East Forty-second St., Houston, Tex.
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Pres., W. S. S. Rodgers
V. P.s, T. J. Donoghue, Houston; F. T. Manley, New York; G. L. Noble, Houston; R. Ogarrio, New York; T. Rieber, New York; H. W. Dodge, H. T. Klein
Sec., E. M. Crone, New York
Treas., C. E. Woodbridge, New York
Mgr. Ref. Dept., F. T. Manley, New York
Supts., F. P. Dodge, Gen. Supt., Port Arthur, Tex.; F. S. Dengler, Port Neches, Tex.; P. L. Gumaer, Houston; R. G. Collins, West Dallas; W. K. Holmes, West Tulsa; D. P. Bailey (Asst. Supt. in charge), Lockport, Ill.; R. H. Donaldson, Shreveport; J. R. Reed, Pryse, Ky.; H. A. Fouts, San Antonio; T. J. Landry, Amarillo; A. E. Higgs, El Paso, Tex.; L. F. Wilking, Casper, Wyo.; T. J. Davidson, Calpet, Wyo.; G. O. Shefstead, Craig, Colo.; P. Beall, Cody, Wyo.; O. M. Webb, Sunburst, Mont.; J. F. Sheeran, Norfolk, Va.; C. G. Cramer, Marcus Hook, Pa.; V. B. Peveto, Providence, R. I.
Domestic Sales Dept., H. W. Dodge, Gen. S. M., New York; J. P. Gruet, Mgr., Northern Territory, New York; J. S. Leach, Mgr., Southern Territory, Houston; S. B. Wright, Mgr., Central Territory, Chicago.
Foreign Sales Dept., T. Rieber, V. P. and Mgr., New York.
Pur. Agt., A. F. Colling, New York
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Texas-Mexican Oil & Refining Co., Laredo, Tex.
Pres., M. T. Cogley
V. P., C. Edw. Cole
Sec. and Treas., Ralph Berry
Gen. Mgr., C. Edw. Cole
Refinery located at Laredo, Tex.

Texas Oil Products Co., Box 775, Gladewater, Tex.
Pres., C. R. Starnes
V. P., Glenn J. Smith
Sec. and Treas., W. H. Harrison
Gen. Supt., W. G. Maness
Tank Car S. M., A. C. Taylor
Ch. Chem., C. H. Bridges
Station S. M., W. M. Longshore
Pur. Agt., E. L. Ames
Traf. Mgr., A. C. Taylor
Refineries located at Gladewater and San Antonio, Tex.

Texas Pacific Coal & Oil Co., Fort Worth National Bank Bldg., Fort Worth, Tex.
Pres., Edgar J. Marston
V. P., John Hancock
V. P. Chg. Ref., E. R. Lederer
V. P. Chg. Sales, O. E. Mitchell
Sec. and Treas., R. Seibel
Supts., T. A. Pomeroy, Wynnewood, Okla.; G. M. Pfau, Fort Worth, Tex.; Dean Hiatt, Caddo, Tex.
Tank Car S. M., F. D. Bostaph
Asst. Sales Mgr., M. Farnsworth
Ch. Egr., Harris Pruitt
Ch. Chem., E. W. Zublin
Pur. Agt., J. C. Davis
Traf. Mgr., E. A. Starr
Refineries located at Wynnewood, Okla.; Fort Worth, Tex., and Caddo Tex.

Texas Petroleum Products Co., Somerset, Tex.
Pres., Grover C. Shaw
V. P., F. H. Witherspoon
Sec. and Treas., W. I. Lighthouse
Supt., G. B. Dartois
Refinery at Somerset, Tex.

Tide Water Oil Co. (Oklahoma), Box 731, Tulsa, Okla.
Pres., E. L. Shea
V. P. Chg. Mfg., C. R. Barton
Sec., Y. P. Broome
Treas, K. R. Hankinson
Supt., R. S. Stanfield, Drumright, Okla.
Tank Car and Station S. M., J. W. Warner
Ch. Egr., M. D. Harris
Ch. Chem., R. W. Boyd
Pur. Agt., M. F. Bridges
Traf. Mgr., C. F. Dowd
Refinery at Drumright, Okla.

Tide Water Oil Co., 17 Battery Place, New York, N. Y.
Pres., Edward L. Shea
V. P.s, Robert McKelvy, Noel Robinson, Edward H. Salrin
Sec., William J. Burlser
Treas., K. R. Hankinson
Gen. Mgr. Ref., C. R. Barton
Supt., H. S. Chase, Bayonne
Tank Car S. M., L. C. Quackenbush
Station S. M., J. D. Collins
Ch. Egr., E. Ellsberg
Ch. Chem., J. McCoy
Pur. Agt., P. W. Fenton
Traf. Mgr., R. D. Kress
Refinery located at Bayonne, N. J.

Tiona Refining Co., 1136 Widener Bldg., Philadelphia, Pa.
Pres., E. M. Lyons
V. P., C. A. Boler
Sec. and Treas., William A. Powell
Gen. Supt., H. W. Walchli
Traf. Mgr., W. E. Miller
Refinery located at Clarendon, Pa.

Toole County Refining Co., Oilmont, Mont.
Pres., G. C. Hoyt
Sec. and Treas., J. A. Coons
Refinery located at Oilmont, Mont.

Triangle Oil & Refining Co., 21 Ave. 43, Venice, Calif.
Pres., Joseph Spray
Refinery located at Venice, Calif.

Trinity Refining Co., P. O. Box 146, Fort Worth, Tex.
Pres., R. B. Farris
V. P.s, Dr. C. D. Halley, R. A. Stuart
Sec., F. L. Mitchell
Gen. Mgr., R. B. Farris
Gen. Supt., W. M. Paull
Prod. Supt., W. F. Hurst
Tank Car S. M., P. L. Jennings
Traf. Mgr., John E. Haynes
Refinery located at Gladewater, Tex.

Trans-Pacific Petroleum Co., 2400 Artesia Blvd., Long Beach, Calif.
Refinery located at Long Beach, Calif.

Tri-State Refining Co., Ashland, Ky.
Pres., Paul G. Blazer
V. P.s, G. C. Davidson, R. W. Grossenbach
Sec., E. L. McDonald
Treas., E. W. Leaton
Gen. Supt., F. W. Irwin
Asst. Supt., C. C. Compton
Tank Car S. M., E. F. Wells
Station S. M., A. A. Hines
Pur. Agt., M. K. Lovell
Ch. Chem., Walter Rife
Traf. Mgr., P. H. Banks
Refinery located at Kenova, W. Va.

Tucker Oil Co., Wichita Falls, Tex.
Pres., J. J. Perkins
V. P., Charles J. Tucker
Sec. and Treas., Harold Murphy
Gen. Supt., Charles J. Tucker
Sales Mgr. (bulk), Charles J. Tucker
Ch. Egr., L. B. Horr
Refinery located at Burkburnett, Tex.

U

Ultra-Penn Refining Co., Box 914, Butler, Pa.
Pres., H. C. Eaton
V. P.s, William Fletcher, H. H. Phillips
Sec. and Treas., F. C. Dodds
Gen. Supt., W. G. Wagner
Asst. Supt., C. J. McCorry
Refinery located at Bruin, Pa.

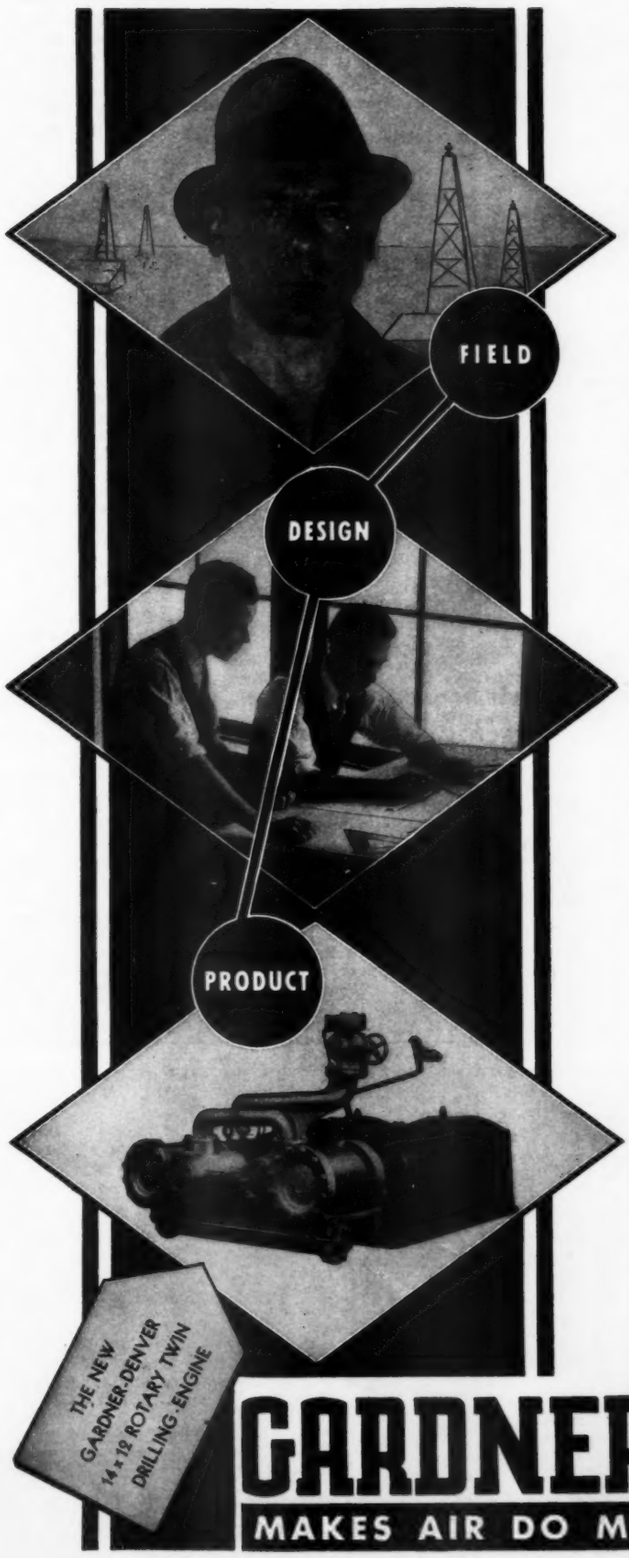
Upshur Refining Co., Inc., Box 676, Gladewater, Tex.
Pres., F. R. Jackson
V. P., Mrs. P. B. Goodwin
Sec., H. Melton
Treas., P. W. Leland
Gen. Mgr., F. R. Jackson
Sales Mgr., H. Melton
Ch. Chem., J. L. Jones
Pur. Agt., C. F. Linsey
Refinery located at Gladewater, Tex.

Union Oil Co. of California, 617 West Seventh St., Los Angeles, Calif.
Pres., L. P. St. Clair
Exec. V. P., R. D. Matthews
V. P.s, W. W. Orcutt, W. L. Stewart, Jr., Paul M. Gregg
Asst. V. P., A. C. Galbraith
Sec., John McPeak
Asst. Secs., W. R. Edwards, A. W. Milford
Comptroller, G. H. Forster
Asst. Compts., J. M. Hannay, A. B. Mason
Treas., J. M. Rust
Asst. Treas., A. C. Marshall
Mgr. Ref., L. G. Metcalf
Supts., A. Roy Heise, Oleum; R. W. Frazier, Avila; H. Ambrosier, Maltha (Bakersfield); C. W. Burtless, Santa Paula; John Salmond, Wilmington (Los Angeles)
Dir. of Sales, V. H. Kelly
Mfg. Ref. Oil Sales, J. M. Geary
Dir. of Mfg., R. E. Haylett
Mgr. Research, Dr. D. R. Merrill
Mgr. Purchases, H. C. Farquhar
Dir. Trans., William Groundwater
Refineries located at Oleum, Avila, Maltha (Bakersfield), Santa Paula, Wilmington (Los Angeles), Calif.

Unit Refining Co., Kilgore, Tex.
Receiver, Mr. Williams, Longview
Refinery located at Kilgore, Tex.

United Refining Co., Warren, Pa.
Pres., F. G. Bannerot
V. P., Treas. and Gen. Mgr., H. A. Logan
Sec., H. W. Schmidt
Asst. Supt., J. S. Cameron
Prod. Eng., MacLean Houston
Ch. Chem., H. W. Wagner
Traf. Mgr., R. E. Brasington
Refinery located at Warren, Pa.

Utah Oil Refining Co., Seventh Floor, Newhouse Bldg., Salt Lake City, Utah. Subsidiary of Standard Oil Co. (Indiana).
Pres., T. A. Dines
V. P.s, William R. Wallace, A. N. Johnson, M. J. Greenwood
Sec. and Treas., A. N. Johnson
Supt., E. S. Holt
Asst. Supt., Frank R. Clark
Tank Car S. M., M. J. Greenwood
Bulk Station S. M., A. S. Brown
Serv. Station S. M., M. H. Sutton
Ch. Egr., R. G. Clark
Ch. Chem., Gordon I. Kirby
Pur. Agt. and Traf. Mgr., W. H. Lovesy
Refinery located at Salt Lake City, Utah



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More wells needed in a big hurry—no time to pamper drilling machinery—no time to replace parts that couldn't stand the gaff. Faced with conditions like this, drilling men came to Gardner-Denver and said, "Make us a drilling engine that doesn't know how to quit."

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114 Williamson Street Quincy, Illinois

Horizontal, Vertical, Air-Cooled and Portable Compressors
Steam and Power Pumps • Rock Drills, Accessories
Paving Breakers • Clay Diggers • Hoists

GARDNER-DENVER

MAKES AIR DO MORE AND COST LESS

V

Vacuum Oil Co., Inc., 26 Broadway, New York City, N. Y. (Subsidiary of Socony-Vacuum Corp.)
Pres., H. F. Sheets
V. P.s, C. W. Hadley, C. L. Jones
Sec., G. V. Holton
Treas., R. P. Tinsley
Supts., J. F. Turner, Olean, N. Y.; J. S. McElfresh, Paulsboro, N. J.
Asst. Supts., W. E. Wanner, Olean; D. L. Hooker, Paulsboro
Pur. Agt., J. R. Taylor
Refineries located at Olean, N. Y.; Paulsboro, N. J.

Valley Refining Co., P. O. Box 11, Harlingen, Tex.
Partnership, A. B. White and L. O. Blocker
Supt., C. R. McGinnis
Refinery located at Harlingen, Tex.

Valley Refining Co., East College Blvd., Roswell, N. Mex.
Pres., S. W. Lodewick
V. P., H. C. Buchy
Sec. and Treas., S. P. Johnson, Jr.
Gen. Mgr., S. W. Lodewick
Gen. Supt., E. A. Wahline
Refinery located at Roswell, N. Mex.

Valvoline Oil Co., Carew Bldg., Cincinnati, Ohio.
Pres., H. W. Edwards
V. P. and Gen. Mgr., C. J. Leroux
V. P.s, H. M. Hart, C. C. Gould, J. M. Marshall and C. W. Luton
Sec., C. C. Gould
Treas., C. J. Leroux
Gen. Supt., C. W. Luton
Supts., C. M. Noyes, Butler, Pa.; H. J. Dunmire, Warren, Pa.; H. W. Winkler, Franklin, Pa.
Asst. Supts., C. M. Noyes, Butler; O. E. Fleming, Franklin.
Tank Car S. M., L. L. Long
Station S. M., J. H. Garlough
Ch. Chem., Louis Calkins
Pur. Agt., E. H. Shepherd
Traf. Mgr., E. A. Barror
Refineries located at Butler, Warren and Franklin, Pa.

Vickers Petroleum Co. of Delaware, Wheeler-Kelly-Hagny Bldg., Wichita, Kans.
Pres., J. A. Vickers
V. P., C. L. Henderson
Sec. and Treas., J. S. Wertz
Gen. Mgr., C. L. Henderson
Supt., A. M. Schrepfer, Potwin, Kans.
Asst. Supt., R. N. Moore, Potwin, Kans.
Tank Car S. M., Myers Gross
Ch. Egr., L. E. Kirk
Pur. Agt. and Traf. Mgr., H. G. Shaw
Refinery located at Potwin, Kans.

W

Wadhams Oil Co., 907 First St., Milwaukee, Wis. (Subsidiary of Socony-Vacuum Corp.)
Chm. Bd., A. G. Maguire
Pres., H. W. Dodge
V. P.s, Henry J. Stolz, Louis McNally, J. M. McLaughlin, M. G. Peeters
Sec. and Compt., R. P. Schwalbach
Treas., R. W. Fritzke, Jr.
Gen. Mgr., Henry J. Stolz
Gen. Supt., Wm. Hildebrandt
Asst. Supt., C. G. Wilson
Tank Car S. M., Harry J. Dolan, Chicago
Station S. M., M. G. Peeters, Milwaukee, Wis.
Ch. Egr., W. Lange, East Chicago, Ind.
Ch. Chem., W. W. Reed, East Chicago, Ind.
Pur. Agt., H. A. Steffen, Milwaukee, Wis.
Traf. Mgr., F. E. Schuder, Milwaukee, Wis.
Refinery located at East Chicago, Ind.

Waggoner Refining Co., Inc., Box 107, Electra, Tex.
Pres., W. T. Waggoner, Sr.
V. P., Guy L. Waggoner
Sec. and Treas., R. L. More
Mgr., D. G. Gray
Supt., J. B. Joyce
Asst. Supt., H. A. Mitchell
Tank Car S. M., H. D. Jenkins
Station S. M., R. F. Schmann
Ch. Chem., G. A. Birdsall
Pur. Agt., J. T. McNamara
Traf. Mgr., O. L. Ely
Refinery located at Electra, Tex.

Warner-Quinlan Co., 2 Park Ave., New York City
Pres., L. V. Nicholas
V. P., W. W. McFarland
Sec. and Treas., A. M. Talbott
Supt., I. K. Giles, Warners, N. J.
Asst. Supt., R. R. Gover, Warners, N. J.
Tank Car S. M., E. M. Grossman
Station S. M., C. M. Southard
Ch. Egr., R. Gove
Ch. Chem., J. A. Lunn
Pur. Agt., A. L. McMillan
Traf. Mgr., R. Riegler
Refinery located at Warners, N. J.

Wasatch Oil Refining Co., 815 McIntyre Bldg., Salt Lake City, Utah
Pres., Wm. H. McIntyre
V. P., Henry D. Moyle
Sec., T. T. Little
Treas., Wm. Yeates
Supt., C. B. Owen
Asst. Supt., Glen Kennick
Refinery located at Woods Cross, Utah

Waverly Oil Works Co., Fifty-fourth St. and A.V.R.R., Pittsburgh, Pa.
Pres., S. M. Vockel
V. P., F. W. Wappat
V. P. Chg. Sales, G. E. Willey
V. P. Chg. Mfg., W. H. Millhiser
Sec., W. E. Allison
Treas., S. K. Cunningham
Gen. Sales Mgr., J. F. King
Ch. Chem., W. T. Sieber
Traf. Mgr., S. Fox
Refineries located at Pittsburgh, Pa., and Coraopolis, Pa. (Coraopolis shut down.)

Western Oil & Refining Co., 416 West Eighth St., Los Angeles, Calif.
Pres., Richard Florian
V. P.s, A. W. Taylor, R. R. Rakestraw
Sec. and Treas., A. A. G. Scherbel
Asst. Sec. and Treas., L. J. Hart
Gen. Supt., R. R. Rakestraw
Supt., O. C. Smith
Asst. Supt., H. H. Spangler
Tank Car and Station S. M., A. W. Taylor
Pur. Agt., J. S. Baum
Refinery located at Wilmington, Calif.

Western States Petroleum Corp., 114 Sansome St., San Francisco, Calif.
Pres., R. L. Durbrow
V. P., B. F. Garrett
Sec. and Treas., M. C. Lintell
Supt., L. Y. Mattes
Asst. Supt., E. E. Greiner
Ch. Chem., F. C. Squier
Refinery located at Long Beach, Calif.

West Texas Refining Co., 1405 Tower Petroleum Bldg., Dallas, Tex.
Pres., F. W. Burford
V. P., John J. Thomas
Sec., John R. Scott
Treas., E. V. Campbell
Gen. Supt., John J. Thomas
Supt., W. J. McCune, Pecos, Tex.
Tank Car S. M., L. R. Brammer
Station S. M., E. S. Capps
Ch. Chem., W. J. McCune
Pur. Agt., W. M. Bisett
Traf. Mgr., A. L. Heine
Refinery located at Pecos, Tex.

White Eagle Refining Co., 1400 Federal Reserve Bank Bldg., Kansas City, Mo. (Subsidiary of Socony-Vacuum Corp.)
Chm. Bd., L. L. Marcell
Pres., R. R. Irwin
V. P.s, R. D. Mering, J. P. Kem
Sec., L. E. Hanson
Treas., E. A. Kermott
Gen. Supt., E. C. Marshall
Supts., C. C. Durkee, Augusta, Kans.; J. W. Glass, Casper, Wyo.
Ch. Egr., G. S. Dunham
Ch. Chem., H. L. Bedell
Refineries located at Augusta, Kans., and Casper, Wyo.

White Star Refining Co., 903 West Grand Blvd., Detroit, Mich. (Subsidiary of Socony-Vacuum Corp.)
Pres., H. A. Coffin
V. P.s, C. B. McCollough, L. R. Hunter
Sec., R. S. Campbell
Treas., M. V. Butler
Gen. Mgr., C. B. McCollough
Gen. Supt., S. G. Keller, Trenton, Mich.
Tank Car S. M., L. T. Morrow
Station S. M., L. R. Hunter
Ch. Chem., E. H. Potthoff
Pur. Agt., J. G. Pyke
Traf. Mgr., R. P. Bowe
Refinery located at Trenton, Mich.

Wickett Refining Co., Wickett, Tex.
Pres., W. B. Hassett
V. P., George W. Buckner
Treas., George W. Buckner
Gen. Supt., J. T. Miller
Tank Car S. M., J. B. Saunders, Clayton, Mo.
Refinery located at Wickett, Tex.

Wilcox, H. F., Oil & Gas Co., Sixth and Denver St., Tulsa, Okla.
Pres., Homer F. Wilcox
V. P. and Gen. Mgr., G. A. Dye
V. P. and Treas., M. P. Appleby
V. P. Chg. Ref., F. H. Dunn
Sec., L. J. Yarbrough
Supts., W. M. Fraser, Bristow, Okla.; John A. Oakes, Pampa, Tex.
Tank Car S. M., H. E. Bangert
Station S. M., L. G. Murrell
Ch. Egr., W. R. Bingham
Pur. Agt., H. B. Ward
Traf. Mgr., T. H. Riggins
Refineries located at Bristow, Okla., and Pampa, Tex.

Williams Refining Co., P. O. Box 1364, Shreveport, La.
Gen. Mgr., W. T. Williams
Refinery located at Shreveport, La.

Wilshire Oil Co., 2455 East Twenty-seventh St., Los Angeles, Calif.
Pres., George R. Machris
V. P. and Sec., Alfred P. Machris
Refinery located at Vernon (Los Angeles), Calif.

Wilson Refining Co. (R. D.), 3000 Walnut St., Long Beach, Calif.
Pres., R. D. Wilson
Refinery located at Long Beach, Calif.

Wolverine-Empire Refining Co., 51 Madison Ave., New York City and Oil City, Pa.
Chm. Bd. and Gen. Mgr., E. W. Chase, Oil City, Pa.
Pres., C. H. Ellingwood, New York
V. P., F. S. Smith, New York
Sec., A. W. Scott, Oil City
Treas., F. H. Baer, New York
Gen. Supt., A. W. Cole, Reno, Pa.
Supt., M. F. Spencer, Tidioute, Pa.
Tank Car S. M., A. W. Scott
Station S. M., H. F. Krathge
Ch. Chem., W. B. Smith, L. M. Baltzell
Refineries located at Reno, Pa., and Tidioute, Pa.

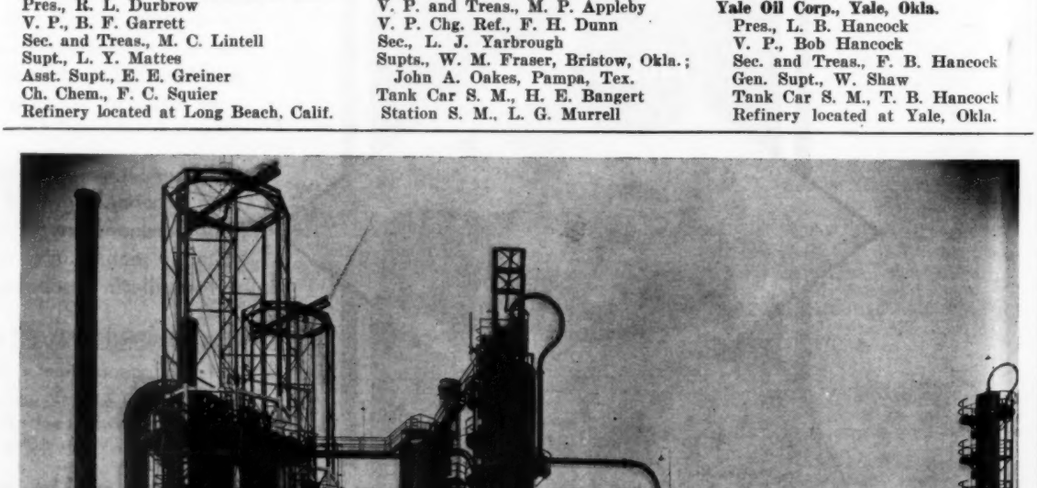
Wyo Gas & Oil Co., Upton, Wyo.
Pres., C. F. Martens
Sec., W. K. Poulson
Refinery located at Upton, Wyo.

Wyoil Refining Co., Con. Roy. Bldg., Casper, Wyo.
Pres., George W. Jarvis
Gen. Supt., Paul Lowney
Refinery located at Mills (suburb of Casper), Wyo.

Y

Yale Oil Corp. of South Dakota, Billings, Mont.
Pres., L. B. Hancock
V. P., P. N. Fortin, Billings
Supt., D. D. Gibson, Billings
Sales Supervisors, L. P. Barney, H. L. Hitchcock
Ch. Egr. and Chem., T. R. Corbett
Refineries located at Billings and Miles City, Mont.

Yale Oil Corp., Yale, Okla.
Pres., L. B. Hancock
V. P., Bob Hancock
Sec. and Treas., F. B. Hancock
Gen. Supt., W. Shaw
Tank Car S. M., T. B. Hancock
Refinery located at Yale, Okla.



Recently completed 9,000-barrel cracking unit at Coffeyville, Kans., refinery of the Sinclair Refining Co. Building on right houses auxiliary pumps and control room. On extreme right is gasoline absorption unit.

Petroleum Refineries Operating in United States

Abbreviations Used in Operating Data

Complete plant (Comp.)—Gasoline, kerosene, gas oil, fuel oil, lubricating oils, paraffin, wax, petroleum coke, asphalt or both coke and asphalt, usually includes cracking. Some plants listed as complete do not manufacture asphalt or coke.
Skimming plants (S)—Gasoline, kerosene distillate, gas oil and fuel oil.
Skimming and lub (S&L)—Gasoline, kerosene distillate, gas oil, fuel oil, and lubricating oils.
Skimming and asphalt (S&A)—Gasoline, kerosene distillate, gas oil, fuel oil and asphalt.
Skimming, lub and asphalt (SL&A)—Gasoline, kerosene distillate, gas oil, fuel oil, lubricating oils and asphalt.
Asphalt plant (A)—Distillates, gas oil, fuel oil and asphalt.
Topping plant (T)—Tops, distillates, gas oil and fuel oil.
Cracking (C)—Same products as skimming.
Lub plant (L)—Gas oil, fuel oil and lubricating oils.
Wax—No separate listing for wax is given in this year's survey. Refiners having lubricating plants in most cases manufacture wax.

ARKANSAS

Company and plant location—	Crude oil cap.	Crack. cap.	Type of refinery	Type of cracking plant
Berry Asphalt Co., Waterloo	2,000	.....	A-L	
Henry H. Cross Co., Smackover	6,000	2,500	S-C	Donnelly
Lion Oil Ref. Co., El Dorado	12,000	4,000	S-C-L-A	Lion
Macmillan Pet. Prod. Co., Norphlet	2,500	.....	S-L-A	
Ouachita Valley Ref. Co., El Dorado	1,500	1,000	S-C	Vapor Phase
Root Ref. Co., El Dorado	12,000	5,000	S-C-L-A	Dubbs, Root
Simms Oil Co., Smackover	3,000	2,000	S-C	
Stephens Ref. Co., Stephens	750	.....	S	
Total	39,750	14,500		

CALIFORNIA

Associated Oil Co., Associated	52,000	20,000	Comp.	Tube and Tank
Associated Oil Co., Wilmington	9,500	7,500	S-C	Tube and Tank
Bachman Pet. Corp., Long Beach	2,000	.....	S	
Bush, R. R., Refinery, Long Beach	3,000	.....	S	
B. & F. Oil & Ref. Co., Playa Del Rey	500	.....	S	
Caminol Co., Ltd., Santa Fe Springs	4,500	.....	T	
Caminol Co., Ltd., Hanford	2,500	.....	T	
Capitol Crude Oil Co., Santa Paula	150	.....	S	
Casmite Co., Casmalia	1,000	.....	A	
Chanslor-Canfield Midway Oil Co., Brea Olinda	1,500	.....	S	
Edington Oil & Ref. Co., Long Beach	4,000	.....	S	
Estado Pet. Corp., Ltd., Long Beach	6,000	.....	T	
Exeter Ref. Co., North Long Beach	8,000	.....	S-A	
General Pet. Corp., Vernon	50,000	.....	S-L	
General Pet. Corp., Torrance	35,000	10,000	S-C	Cross
General Pet. Corp., Lebec	12,000	.....	S	
Gilmore Oil Co., Ltd., Los Angeles	2,500	.....	T	
Gilmore Oil Co., Ltd., Orcutt	700	.....	T	
Hancock Oil Co., Long Beach	15,000	2,000	S-C	Vapor Phase
Kolingo Refining Co., Coalinga	200	.....	S	
Lake View Oil & Ref. Co., Maricopa	3,000	.....	S	
Macmillan Pet. Corp., Long Beach	7,500	.....	S	
Mohawk Pet. Co., Bakersfield	3,000	.....	T	
Monarch Refineries, Venice	2,500	.....	S	
Norwalk Co., Maricopa	2,500	.....	S	
Olympic Ref. Co., Long Beach	6,000	.....	S	
McCallen, M. M., Ref. Co., Huntington Beach	400	.....	A	
Paraffine Co., Inc., Emeryville	1,200	.....	A	
Petrol Corp., Los Angeles	6,500	.....	S-T	
Petrol Corp., Los Angeles	2,000	.....	A	
Pioneer Paper Co., Vernon	700	.....	A	
Richfield Oil Co., Watson	50,000	16,000	Comp.	Black
Richfield Oil Co., Hynes	55,000	14,000	S-C	Cross
Rio Grande Oil Co., Vinvale	10,000	2,000	S-C	Jenkins
Seaside Oil Co., Ventura	5,000	.....	S-A	
Seaside Oil Co., Summerland	2,000	.....	A	
Shell Oil Co., Wilmington	38,000	18,400	S-C	Dubbs
Shell Oil Co., Martinez	36,500	21,000	Comp.	Dubbs, Shell
Shell Oil Co., Coalinga	4,200	.....	S	
Shell Oil Co., Dominguez	.....	34,800	C	Dubbs
San Fernando Ref. Co., Newhall	2,000	.....	S-A	
Socal Oil & Ref. Co., Huntington Beach	3,000	.....	S	
Standard Oil Co. of Calif., Richmond	100,000	18,200	Comp.	Richmond
Standard Oil Co. of Calif., El Segundo	100,000	36,300	Comp.	Modified Richmond
Standard Oil Co. of Calif., Bakersfield	25,000	.....	S-A	
Steiner (Louis), Long Beach	500	.....	S	
Steiner Ref. Co., Long Beach	1,000	.....	S	
St. Helens Pet. Co., Ltd., Pico (Los Angeles County)	5,000	.....	S	
Terra Bella Ref. Co., Ltd., Terra Bella	400	.....	L	
Texas Co. (Calif.), Los Angeles	30,000	5,500	S-C	Holmes-Manley
Texas Co. (Calif.), Fillmore	4,000	2,700	S-C	Cross
Triangle Oil & Ref. Co., Venice	300	.....	S	
Trans-Pacific Pet. Co., Long Beach	1,000	.....	S	
Union Oil Co. (Calif.), Wilmington	51,000	21,000	S-C-A	Cross
Union Oil Co. (Calif.), Oleum	17,000	.....	S-A-L	
Union Oil Co. (Calif.), Bakersfield	5,000	.....	S	
Union Oil Co. (Calif.), Santa Paula	900	.....	S	
Western Oil & Ref. Co., Wilmington	12,000	4,200	S-C	Jenkins
Wilshire Oil Co., Vernon	20,000	.....	S	
Wilson Ref. Co. (R. D.)	1,500	.....	S	
Total	825,650	233,600		

COLORADO

Company and plant location—	Crude oil cap.	Crack. cap.	Type of refinery	Type of cracking plant
Continental Oil Co., Florence	3,000	1,500	S-C	Burton
Continental Oil Co., Denver	1,500	1,000	S-C	Cross
Midland Oil Ref. Co., Denver	1,500	.....	S-A	
Mountain States Ref. Co., Orchard	200	.....	S	
Texas Co., Craig	1,000	1,500	S-C	Holmes-Manley
Raven Oil & Ref. Co., Rangely	200	.....	S	
Total	7,400	4,000		

GEORGIA

Atlantic Ref. Co., Brunswick	5,000	3,600	Comp.	Lewis
Pan American Pet. & Trans. Co., Savannah	4,000	.....	A	
Total	9,000	3,600		

ILLINOIS

Cross, Henry H., Co., Joliet	2,500	.....	S	
Cross, Henry H., Co., Dupo	1,000	.....	S	
Globe Oil & Ref. Co., Lemont	10,000	6,000	S-C	Winkler-Koch
Indian Ref. Co., Lawrenceville	16,000	9,500	Comp.	Cross, deFlorez
Lincoln Oil Ref. Co., Robinson	10,000	9,600	Comp.	Holmes-Manley
Lubrite Ref. Corp., East St. Louis	4,750	3,200	S-C	Pratt Vapor Phase
Red River Ref. Co., Inc., Burnham	1,200	.....	L	
Shell Pet. Corp., Wood River	38,000	23,000	Comp.	Dubbs, T.V.P., Cross
Standard Oil Co. (Indiana) Wood River	22,000	20,000	Comp.	Holmes-Manley
Texas Co., Lockport	20,000	16,000	S-C-A	Holmes-Manley, deFlorez, Pressure Coke
Total	125,450	87,300		

INDIANA

Empire Oil & Ref. Co., East Chicago	25,000	15,000	S-C	Doherty
Shell Pet. Corp., East Chicago	27,000	22,000	T-C	Dubbs
Sinclair Ref. Co., East Chicago	40,000	30,000	Comp.	Isom, Sinclair
Standard Oil Co. (Indiana), Whiting	99,000	65,000	Comp.	Cross, Holmes-Manley
Wadham Oil Co., East Chicago	6,000	4,000	S-C-T	Jenkins, Winkler-Koch, Naphtha Reformer
Total	197,000	136,000		

KANSAS

Altitude Pet. Corp., Chanute	5,000	3,500	S-C	Jenkins
Barnsdall Refineries, Inc., Wichita	5,000	1,500	S-C	Dubbs
Derby Oil Co., Wichita	8,000	3,000	S-C	Dubbs
Dickey Ref. Co., McPherson	5,000	1,500	S-C	Dickey
Eldorado Ref. Co., Eldorado	4,500	1,500	S-C	Winkler-Koch
Falcon Refining Co., Great Bend	800	.....	S	
Globe Oil & Ref. Co., McPherson	10,000	6,000	S-C	Winkler-Koch
Golden Rule Ref. Co., Wichita	1,000	500	S-C	Jenkins
Kansas Gas & Gasoline Co., Winfield	500	.....	S	
Kanotex Ref. Co., Arkansas City	12,000	4,000	S-C	Tube
Kreuger Refining Co., Laton	150	.....	S	
National Ref. Co., Coffeyville	5,500	2,500	L	National
Petroleum Products Co., Chanute	250	.....	S	
Phillips Pet. Co., Kansas City*	15,000	2,500	S-C	Dubbs
Security Pet. Corp., Chase	3,100	.....	S	
Shell Pet. Corp., Arkansas City	20,000	9,000	S-C	Dubbs
Sinclair Ref. Co., Coffeyville	12,000	7,500	Comp.	Isom, Sinclair
Sinclair Ref. Co., Kansas City	11,000	5,000	S-C	Isom
Skelly Oil Co., Eldorado	23,000	14,500	T-C	Skelly
Standard Oil Co. (Indiana), Neodesha	8,000	15,000	S-C	Holmes-Manley, Cracking Coil
United Oil & Ref. Co., Hutchinson	1,500	.....	S	
Vickers Pet. Co., Potwin	3,500	1,500	S-C	Dubbs
White Eagle Oil Corp., Augusta	16,000	10,000	Comp.	White Eagle
Total	170,800	89,000		

*Plant owned by Independent Oil & Gas Co., a subsidiary of Phillips Pet. Co.

KENTUCKY

Aetna Oil Service, Inc., Louisville	2,000	600	S-C	Fleming
Ashland Ref. Co., Inc., Catlettsburg	4,200	2,200	S-C-A	Dubbs
Bowling Green Ref. Co., Memphis Junc.	1,500	.....	S	
Glasgow Oil & Ref. Co., Glasgow	250	.....	S	
Greenville Ref. Co., Greenville	100	.....	S	
Louisville Ref. Co., Inc., Louisville	4,000	1,800	S-C	Dubbs
Simrall Ref. Corp., Horse Cave	2,500	.....	S	
South Kentucky Pipe Line Co., Somerset	400	.....	S	
Standard Oil Co. (Ohio), Latonia	8,000	5,000	S-C-A	Tube & Tank
Stoll Oil Ref. Co., Louisville	3,000	.....	L	
Texas Co., Pryse	2,500	2,000	S-C	Holmes-Manley
Total	28,450	11,600		

LOUISIANA

Bayou State Ref. Corp., Hosston	600	.....	L	
Cedar Grove Ref. Co., Shreveport	1,500	1,000	S-C	
Chalmette Pet. Corp., Chalmette	7,000	4,000	S-C-T	Winkler-Koch
Louisiana Oil Ref. Corp., Bossier Parish	15,000	22,000	S-C	Tube & Tank
Louisiana Oil Ref. Corp., Caddo Parish	15,000	.....	S	

(Continued on Next Page)

LOUISIANA (Continued)

Company and plant location—	Crude oil cap.	Crack. cap.	Type of refinery	Type of cracking plant
Pan American Southern Corp., Destrehan	20,000	.....	S-A	
Shell Pet. Corp., Norco	16,000	10,000	T-C-A	Dubbs
Stanolind Oil & Gas Co., Superior	5,000	2,200	C-T	Cross
Spartan Ref. Co., Inc., Shreveport	12,000	4,000	S-C	Gyro
Standard Oil Co. of La., Baton Rouge	100,000	40,000	Comp.	Tube & Tank
Texas Co., Ardis (Shreveport)	7,000	.....	S	
Total	199,100	83,200		

MARYLAND

Continental Oil Co., Baltimore	10,000	7,000	S-C	Dubbs, Cross
Pan American Pet. & Trans. Co., Baltimore	8,000	.....	A	
Standard Oil Co. of New Jersey, Baltimore	37,000	52,572	Comp.	Tube & Tank
Total	55,000	59,572		

MASSACHUSETTS

Cities Service Ref. Co., East Braintree	20,000	6,300	Comp.	Doherty, Holmes-Manley
Colonial Beacon Oil Co., Everett	28,000	24,000	S-C-A	Tube & Tank
Total	48,000	30,300		

MICHIGAN

Naph-Sol Ref. Co., Muskegon	2,500	.....	S	
Old Dutch Ref. Co., Muskegon	3,000	.....	S-T	
Pure Oil Co., Midland	3,000	.....	S	
Roosevelt Oil Co., Mount Pleasant	3,500	.....	S	
White Star Ref. Co., Trenton	7,000	6,600	S-C	Dubbs, Controlled Coil
Total	19,000	6,600		

MISSOURI

Altitude Pet. Corp., Kansas City	3,500	2,400	S-C	Burton and Miehl
Joplin Ref. Co., Joplin	1,500	1,000	S-C	Jenkins
Standard Oil Co. (Ind.), Sugar Creek	18,000	15,000	Comp.	Burton, Holmes-Manley
Total	23,000	18,400		

MONTANA

Arro Oil & Ref. Co., Lewistown	2,000	1,000	S-C	Dubbs
Bighorn Oil & Ref. Co., Billings	400	.....	S-A	
Big West Oil Co., Kevin	1,000	500	S-C	Dubbs
Boris, A. S., Aronow, Kalispell	2,000	600	S-C	Vapor Phase
Boris, A. S., Aronow, Havre	400	.....	S	
Conrad Ref. Co., Conrad	1,000	.....	S	
Consumers Ref. Co., Collins	500	.....	S	
Continental Oil Co., Lewistown	1,500	.....	S	
Cut Bank Refining Co., Cut Bank	175	.....	S	
Hart Refineries, Hedgesville	100	.....	S	
Hart Refineries, Missoula	300	.....	S	
Home Oil & Ref. Co., Great Falls	1,000	.....	S	
Independent Ref. Co., Laurel*	5,000	1,500	S-C	
McKeehan (C. A.), Molt, Mont.	3	.....	S	
River Dome Oil Co., Roundup	25	.....	S	
Russell Oil Co., Butte	1,000	.....	S	
Russell Oil Co., Billings	1,800	.....	S	
Snow Cap Oil Co., Sunburst	350	200	S-C	Experimental
Texas Co. (International), Sunburst	3,000	2,500	S-C	deFlorez
Toole County Ref. Co., Oilmont	300	.....	S	
Yale Oil Corp. of S. Dak., Billings	2,000	.....	S	
Total	23,853	6,300		

*Operating, cracking and coking plant only.

NEW JERSEY

Barber Asphalt Co., Maurer*	6,000	2,500	S-A	Cross
Crew Levick Co., Pettys Island	8,000	4,500	S-C	Doherty
Middlesex Ref. Co.†	5,000	.....	S-C	
Standard Oil Co. of N. J., Bayonne	70,000	29,714	Comp.	Tube & Tank
Standard Oil Co. of N. J., Linden	70,000	172,571	Comp.	Tube & Tank
Standard Oil Co. of N. J., Jersey City	15,000	.....	L	
Tide Water Oil Co., Bayonne	50,000	25,000	Comp.	Tube & Tank
Vacuum Oil Co., Inc., Paulsboro	20,000	9,000	Comp.	Cross, Ellis
Warner-Quinlan Oil Co., Warners	18,000	.....	S-A	
Total	262,000	243,285		

*Cracking plant operated by Betrin Petroleum Co.
†Expects to operate by May 1, 1934.

NEW YORK

Gulf Ref. Co., Staten Island	15,000	.....	S	
Sinclair Ref. Co., Wellsville	10,000	5,000	Comp.	Isom, Sinclair
Standard Oil Co. of N. Y., Brooklyn and Long Island City	19,000	10,000	Comp.	Cross, deFlorez
Standard Oil Co. of N. Y., Buffalo	5,000	4,000	Comp.	Cross, deFlorez
Vacuum Oil Co., Inc., Olean	6,500	3,000	Comp.	Cross, Ellis
Total	55,500	22,000		

NEW MEXICO

Basin Ref. Co., Aztec	50	.....	S	
Continental Oil Co., Farmington	1,000	.....	S	
Continental Oil Co., Artesia	1,500	.....	S	

NEW MEXICO (Continued)

Company and plant location—	Crude oil cap.	Crack. cap.	Type of refinery	Type of cracking plant
Continental Oil Co., Albuquerque	1,000	.....	S	
Malco Ref., Inc., Artesia	1,500	.....	S	
Pecos Diamond Ref. Co., Artesia	250	.....	S	
Valley Ref. Co., Roswell	500	250	S-C	Valley
Total	5,800	250		

OHIO

Allegheny-Arrow Oil Co., Canton	1,500	850	S-C	Dubbs
Gulf Ref. Co., Toledo	13,000	6,000	C-T	Gulf
Gulf Ref. Co., Cincinnati	13,000	6,000	C-T-A	Gulf
Canfield Oil Co., Cleveland	1,000	.....	L	
National Ref. Co., Findlay	2,000	.....	L	
National Refining Co., Marietta	580	.....	L	
Peninsula Oil Co., Catawba Island	60	.....	S	
Pure Oil Co., Heath	9,500	8,000	S-C	Gyro, Cross
Pure Oil Co., Toledo	9,500	8,000	S-C	Gyro
Standard Oil Co. of Ohio, Cleveland	20,000	10,000	Comp.	Tube & Tank
Standard Oil Co. of Ohio, Toledo	12,000	4,000	Comp.	Tube & Tank
Standard Oil Co. of Ohio, Lima	7,500	11,000	S-C-L	Solar, Cross
Sun Oil Co., Toledo	14,000	6,000	S-C	Sun
Superoil Co., Toledo	350	.....	L	
Total	103,990	58,850		

OKLAHOMA

Altitude Pet. Corp., Oklahoma City	2,500	.....	S	
Anderson-Prichard Oil Corp., Cyril	6,000	3,000	S-C	Winkler-Koch
Barnsdall Refs., Inc., Okmulgee	11,000	4,500	S-C	Cross
Barnsdall Refs., Inc., Barnsdall	5,000	4,000	S-L-C	Cross
Bell Oil & Gas Co., Grandfield	4,500	1,700	S-C	Dubbs
Black Gold Ref. Co., Oklahoma City	2,500	1,000	S-C	Black Gold
Century Pet. Co., Oklahoma City	2,500	.....	S	
Champlin Ref. Co., Enid	15,000	6,000	S-C-L	Cross, Winkler-Koch
Cole, L. S., Ref. Co., Oklahoma City	500	.....	S	
Columbia Ref. Co., Oklahoma City	2,500	.....	S	
Continental Oil Co., Ponca City	30,000	13,000	Comp.	Dubbs, Cross
Cushing Ref. & Gaso. Co., Cushing	4,500	.....	S	
Cushing Ref. & Gaso. Co., Blackwell	1,800	.....	S	
Deep Rock Oil Corp., Cushing	10,000	4,000	Comp.	Dubbs
Eason Oil Co., Enid	5,000	2,000	S-C	Jenkins
Empire Oil & Ref. Co., Okmulgee	4,000	1,000	Comp.	Doherty
Empire Oil & Ref. Co., Ponca City	12,000	4,500	Comp.	Dubbs, Doherty
Firestone Ref. Co., Oklahoma City	2,000	.....	S	
Government Ref. Co. No. 2, Oklahoma City	3,500	.....	S	
Globe Oil & Ref. Co., Blackwell	8,000	4,000	S-C	Winkler-Koch
Hanger Ref. Co., Oklahoma City	1,000	.....	S	
Johnson Oil Ref. Co., Cleveland	6,000	2,000	S-C	Dubbs
Major Petroleum Products Co., Oklahoma City	1,500	.....	S	
Marathon Oil Co., Bristow	5,000	1,500	S-C	Kellogg
Mid-Continent Pet. Corp., Tulsa	40,000	10,000	Comp.	Mid-Continent
Oklahoma City Ref. Co., Oklahoma City	2,500	.....	S	
Pilgrim, Inc., Ardmore	70	.....	L	
Phillips Pet. Co., Okmulgee*	6,000	2,500	S-C-L	Dubbs
Producers Oil Co., Bristow	1,500	.....	S	
Producers & Refiners Corp., Tulsa	6,000	3,000	S-C	Dubbs
Pure Oil Co., Muskogee	9,000	4,700	Comp.	Cross, Gyro
Rock Island Ref. Co., Beckett	6,500	2,000	S-C	Winkler-Koch
Sinclair Ref. Co., Sand Springs	8,000	2,500	Comp.	Cross
Sooner State Ref. Co., Oklahoma City	300	.....	S	
Sun Oil Co., Yale	5,000	.....	S	
Sunray Oil Co., Allen†	6,000	.....	S-A	
Texas Pacific Coal & Oil Co., Wynnewood	3,000	.....	A	
Texas Co., Tulsa	14,000	12,500	S-C	Holmes-Manley, Pressure Coke
Tide Water Oil Co. of Okla., Drumright	18,000	7,000	S-C	Tube & Tank, Modified Burton
Triangle Prod. & Ref. Co., Oklahoma City	1,000	.....	S	
Western Oil Corp., Beckett	2,000	1,200	S-C	Jenkins
Wilcox, H. F., Oil & Gas Co., Bristow	5,000	1,200	S-C	Dubbs
Wirt Franklin Pet. Corp., Ardmore	4,000	.....	S-A	
Yale Oil Corp., Yale	2,000	.....	S	
Total	286,170	98,800		

*Plant owned by Independent Oil & Gas Co. (a subsidiary of Phillips Petroleum Co.). Only cracking unit operating.
†1,200-bbl. Dubbs cracking plant to be completed at Allen July 1.

PENNSYLVANIA

Atlantic Ref. Co., Philadelphia	65,000	31,800	Comp.	Lewis, Cross, deFlorez
Atlantic Ref. Co., Franklin	9,000	6,000	Comp.	Cross
Atlantic Ref. Co., Pittsburgh	8,000	4,000	Comp.	Cross
James B. Berry Sons Co., Inc., Oil City	2,500	.....	S-L	
Bradford Penn Ref. Corp., Clarendon	500	.....	S-L	
Bradford Oil Ref. Co., Bradford	1,500	.....	S-L	
Canfield Oil Co., Coraopolis	1,500	.....	L	
Carnegie Ref. Co., Carnegie	1,000	.....	Comp.	
Continental Ref. Co., Oil City	1,000	*2,500	S-C-L	Dubbs
Conewango Ref. Co., Warren	2,000	.....	S-L	
Crew-Levick Co., Titusville	3,000	.....	S-L	
Crystal Oil Works, Rouseville	1,000	.....	S-L	
Daugherty, W. H., & Son Ref. Co., Petrolia	2,000	.....	S-L	

(Continued on Next Page)

PENNSYLVANIA (Continued)

Company and plant location—	Crude oil cap.	Crack. cap.	Type of refinery	Type of cracking plant
Franklin Creek Ref. Co., Franklin	1,500	.....	S-L	
Freedom Oil Works Co., Freedom	2,500	.....	L	
Gulf Ref. Co., Philadelphia	30,000	19,000	S-C-T	Gulf
Gulf Ref. Co., Pittsburgh	8,000	3,000	C-T	Gulf
Kendall Ref. Co., Bradford	3,500	2,500	Comp.	Dubbs
Miller, A. D., Sons Co., Pittsburgh	1,000	....	S-L	
Oil Creek Refining Co., East Titusville	1,800	.....	S-L	
Pennsylvania Oil Products Co., Eldred	5,000	1,000	S-C-L	Conerty
Pennsylvania Ref. Co., Karns City	2,000	.....	S-L	
Pennsylvania Ref. Co., Titusville	1,500	.....	S-L	
Pennzoil Co., The, Rouseville	8,000	4,500	Comp.	Dubbs
Pure Oil Co., Marcus Hook	15,000	11,400	Comp.	Gyro, Cross
Quaker State Oil Ref. Corp., Farmers Valley	3,000	1,500	Comp.	Dubbs
Quaker State Oil Ref. Corp., Emlenton	2,000	1,000	Comp.	Dubbs
Sherwood Ref. Co., Warren	750	.....	S-L	
Sinclair Ref. Co., Marcus Hook	27,000	10,000	S-C	Isom, Sinclair
Sloan & Zook Ref. Co., Warren	1,500	.....	S-L	
Superior Oil Works, Warren	500	.....	S-L	
Starlight Ref. Co., Karns City	600	.....	L	
Sun Oil Co., Marcus Hook	63,000	15,000	Comp.	Sun
Texas Co., Marcus Hook	2,000	.....	A	
Tiona Ref. Co., Clarendon	1,000	.....	S-L	
Ultra-Penn Ref. Co., Bruin	1,000	.....	Comp.	Snodgrass
United Ref. Co., Warren	2,000	.....	S-L	
Valvoline Oil Co., Butler	2,500	.....	S-L	
Valvoline Oil Co., Warren	1,000	.....	S-L	
Waverly Oil Works Co., Pittsburgh	1,000	.....	S-L	
Wolverine-Empire Ref. Co., Reno	1,200	.....	S-L	
Wolverine-Empire Ref. Co., Tidioute	800	.....	S-L	
Total	288,650	81,400		

*Cracking plant owned jointly by Pennzoil Co., James B. Berry Sons Co., Inc., Wolverine, Empire Refining Co. and Continental Refining Co.

RHODE ISLAND

Company and plant location—	Crude oil cap.	Crack. cap.	Type of refinery	Type of cracking plant
Standard Oil Co. of N. Y., Inc., Providence	9,000	4,000	A-C	Cross
Texas Co., Providence	2,000	.....	A	
Total	11,000	4,000		

SOUTH CAROLINA

Company and plant location—	Crude oil cap.	Crack. cap.	Type of refinery	Type of cracking plant
Standard Oil Co. of N. J., Charleston	6,500	.....	A	Tube & Tank

TEXAS

Company and plant location—	Crude oil cap.	Crack. cap.	Type of refinery	Type of cracking plant
Aero Ref. Co., Pecos	225	.....	S	
All State Ref. Co., Thrall	2,200	.....	S	
American Pet. Co., Houston	4,000	.....	S	
Amsco Ref. Co., Mirando City	2,500	.....	S	
Arpana Ref. Co., Arp	4,000	.....	S	
Arrow Ref. & Prod. Co., Overton	5,000	.....	S	
Archer Ref. Corp., Megargel	1,500	.....	S	
Atlantic-Pacific & Gulf Ref. Co., Wichita Falls	5,000	1,250	S-C	Jenkins
Baird Ref. Co., Baird	1,400	1,000	S-C	Dayson
Beacon Oil & Ref. Co., Henderson	3,500	.....	S	
Bee Oil & Ref. Co., Pettus	1,000	.....	S	
Bluebonnett Oil Ref. Co., Wickett	5,000	.....	S	
Canyon Oil & Gas Co., Inc., Cisco	400	.....	S	
Canyon Refining Co., Kilgore	200	.....	S	
Carnation Ref. Corp., Gladewater	200	.....	S	
Century Ref. Co., Friars Switch	2,000	.....	S	
Chapa Ref. Co., Laredo	100	.....	S	
Chief Refining Co., Inc.	1,000	.....	S	
Coltex Ref. Co., Colorado	10,000	400	S-C	Std. of Calif.
Concho Ref. Co., San Angelo	200	.....	S	
Conroe Oil & Ref. Co., Conroe	250	.....	S	
Continental Oil Co., Wichita Falls	5,000	2,300	S-C	Cross
Cosden Oil Co., Big Spring	10,000	5,000	S-C	Jenkins
Col-Tex Ref. Co., Colorado	10,000	4,000	S-C	Own
Crescent Oil & Ref. Co., Houston	1,000	.....	S	
Crown Central Pet. Corp., Houston	8,000	6,000	S-C	Holmes-Manley
Dale Oil & Ref. Co., Wichita Falls	4,000	.....	S	
Danciger Refineries, Inc., Pampa	6,500	.....	S-C	
Diamond Ref. Co., Overton	2,500	.....	S	
Duckworth & Chandler Ref. Co., Gladewater	500	.....	S	
Dutch Rose Ref. Co., Gladewater	750	.....	S	
E. & F. Ref. Co., Kilgore	200	.....	S	
East Texas Refined Prod. Co., Kilgore	700	.....	S	
East Texas Ref. Co., Longview	10,000	.....	T-C	Donnelly
Empire Oil & Ref. Co., Gainesville	5,000	2,000	S-C	Dubbs
Exchange Pet. Co., Albany	800	.....	S	
Falls Refining Co., Wichita Falls	2,500	.....	S	
Foshee Ref. Co., Gladewater	1,500	.....	S	
Gilliland Oil Co., Gladewater	1,000	.....	S	
Godlin Ref. Co., Gladewater	850	.....	S	
Goodson-Gentry Ref. Co., Gladewater	850	.....	S	
Gratex Ref. Co., Graham	500	.....	S	
Gregg Ref. Co., Gladewater	300	.....	S	
Gulf Ref. Co., Port Arthur	100,000	50,000	Comp.	Gulf
Gulf Ref. Co., Fort Worth	6,000	3,000	S-C	Gulf
Gulf Ref. Co., Sweetwater	5,000	4,000	S-C	Gulf
Hanover Ref. Co., Kilgore	800	.....	S	
Haskell Oil Ref. Corp., Breckenridge	200	.....	S	
Hawk Ref. Co., Gladewater	800	.....	S	
Hix-Keller Ref. Co., Kilgore	1,000	.....	S	
Houston Oil Co. of Texas, Viola	1,000	.....	S	
Howard County Ref. Co., Big Spring	2,500	.....	S	

TEXAS (Continued)

Company and plant location—	Crude oil cap.	Crack. cap.	Type of refinery	Type of cracking plant
Humble Oil & Ref. Co., Ingleside	12,000	7,800	S-C	Tube & Tank
Humble Oil & Ref. Co., Baytown	90,000	60,600	Comp.	Cross, Tube & Tank
Humble Oil & Ref. Co., San Antonio	4,500	.....	S-A	
Humble Oil & Ref. Co., Neches	5,000	.....	T	
Jacksboro Ref. Co., Jacksboro	50	.....	S	
Johnson Ref. Co., Kilgore	1,000	.....	S	
Johnsonville Ref. Co., Omega	200	.....	S	
Keystone Ref. Co., Gladewater	1,000	.....	S	
Kilgore Ref. Co., Kilgore	1,500	750	S-C	
La Pren Ref. Co., Kilgore	1,500	.....	S	
Lake Ref. Co., Gladewater	500	.....	S	
Lindsey Ref. Co., Gladewater	2,500	.....	S	
Locke Ref. Co. No. 2, Gladewater	1,500	.....	S	
Locke Ref. Co., Gladewater	2,000	.....	S	
LaSalle Petroleum Co., Burkburnett	3,500	.....	S	
Lotus Refinery, Gladewater	1,200	.....	S	
Maritime Oil Co. Houston	3,000	.....	T-A	
Master Pet. Co., Waco	1,000	.....	S	
Magnolia Pet. Co., Beaumont	70,000	55,000	Comp.	Cross
Magnolia Pet. Co., Fort Worth No. 1	6,000	3,500	S-A-C	Cross
Magnolia Pet. Co., Corsicana	4,000	.....	S	
Magnolia Pet. Co., Luling	5,000	3,750	S-C	Controlled Coil
Marathon Oil Co., Fort Worth	5,000	1,500	S-L-C	Kellogg
McNutt Ref. Co., El Paso	2,000	.....	S	
Minerva Ref. Co., Minerva	2,000	.....	S	
Misko Refs., Inc., Laredo	2,200	1,200	S-C-L	Misko
Mentone Oil & Ref., Arno	1,000	.....	S	
Moutray Oil Co., Hawley	750	.....	S	
Muenster Ref. Co., Muenster	300	.....	S	
Nolting Ref. Co., Sweetwater	1,000	.....	S	
O. K. Ref. Co., Kilgore	1,000	.....	S	
Oil Refineries, Inc., Overton	4,000	.....	S	
Olney Oil & Ref. Co., Olney	2,500	1,500	S-C	Donnelly
Omega Ref. Co., Brownwood	130	.....	S	
Oriental Oil Co., Dallas	1,500	1,500	S-C	Floyd
Overton Ref. Co., Overton	4,000	750	S-C	Overton
Owl Ref. Co., Kilgore	1,800	.....	S	
Owl Ref. Co., Arp	1,500	.....	S	
Panama Ref. Co., Kilgore	3,000	.....	S	
Pan American Pet. & Trans. Co., Texas City*	25,000	25,000	(*)	
Panhandle Ref. Co., Wichita Falls	3,000	1,700	S-C	Dubbs
Panhandle Ref. Co., Kings Mill	2,500	.....	S	
Paramount Refineries, San Angelo	2,000	.....	S	
Paragon Refining Co., Leuders	400	.....	S	
Pasotex Pet. Co., El Paso	14,000	4,000	S-C	Dubbs
Pennant Ref. Co., Kilgore	250	.....	S	
Pentex Ref. Co., Echo	400	.....	S	
Phoenix Ref. Co., Pettus	600	.....	S	
Phoenix Ref. Co., Pettus	1,000	.....	S	
Phoenix Ref. Co., Inc., Dallas	1,000	.....	S	
Phoenix Ref. Co., San Antonio	500	.....	S	
Phillips Pet. Co., Borger	30,000	12,000	S-C	Phillips
Pilot Point Ref. Co., Pilot Point	500	.....	S	
Pine Ref. Co., Camp Switch	2,500	.....	S	
Pioneer Oil & Ref. Co., Somerset	2,000	.....	S-L	
Price Ref. Co., San Antonio	500	.....	S	
Primrose Refining Co., Wichita Falls	2,500	.....	S	
Pure Oil Co., Smiths Bluff (Nederland)	26,000	15,450	S-C	Gyro
Recla Ref. Co., Turnerstown	200	.....	S	
Republic Oil & Ref. Co., Texas City	5,000	1,500	S-C	Winkler-Koch
Roco Ref. Co., Kilgore	1,200	.....	S	
Rusk Ref. Co., Overton	3,000	.....	S	
Sabine Refining Co., Gladewater	200	.....	S	
San Angelo Ref. Co., San Angelo	2,000	.....	S	
Sandy Ref. Co., Big Sandy	1,000	.....	S	
Security Pet. Co., Chase	3,100	.....	S	
Shamrock Oil & Gas Co., Meldavis	1,000	.....	S	
Shamrock Oil & Gas Co., Sunray	2,800	.....	S	
Shell Pet. Corp., Houston	42,000	21,000	T-C	Dubbs
Shoreline Ref. Co., Kilgore	300	.....	S	
Simms Oil Co., Dallas	4,000	3,200	S-C	
Sinclair Ref. Co., Gladewater	2,500	.....	S	
Sinclair Ref. Co., Houston	40,000	25,000	Comp.	Isom, Sinclair
Sinclair Ref. Co., Fort Worth	4,000	.....	S-C	Sinclair
Sinclair Ref. Co., El Paso	5,000	.....	S	
Solar Refining Co., Overton	3,000	.....	S	
Southern Ref. Co., Kilgore	3,000	.....	S	
Southern Ref. Co., Reeds Switch	2,500	.....	S	
Southport Ref. Co., Kilgore	2,500	.....	S	
Star Ref. & Prod. Co., Fort Worth	1,200	600	S-C	
Stone Oil Co., Texas City	6,000	2,000	C-T	Jenkins
Superior Ref. Co., Tiffin	800	.....	S	
Supreme Ref. Co., Gladewater	1,000	.....	S	
Taxman Ref. Co., Wichita Falls	3,500	1,500	S-C	Donnelly
Taylor Ref. Co., Tyler	15,000	10,000	S-C	Rowsey
Taylor Ref. Co., Taylor	5,000	3,000	S-C	Rowsey
Texas Co., Port Arthur	65,000	96,000	Comp.	Holmes-Manley, deFlorez, Pressure Coke
Texas Co., West Dallas	16,000	9,600	S-C	Holmes-Manley, deFlorez, Pressure Coke
Texas Co., Amarillo	4,000	3,200	S-C	Pressure Coke, deFlorez
Texas Co., Port Neches	20,000	.....	A	
Texas Co., Houston	20,000	1,000	S-C	Tube & Tank
Texas Co., San Antonio	3,500	3,000	S-C	Holmes-Manley

(Continued on Next Page)

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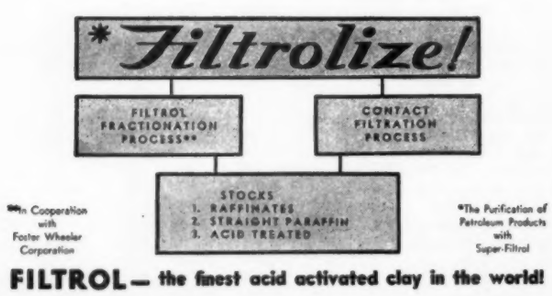
..but I've bought many carloads on its merits

Ten years of constant research, development and improvement, at the mine, in the Filtrol plant and laboratories and in petroleum refineries have made possible, the world's finest activated clay,—SUPER-FILTROL.

Its efficiency and economy in the manufacture of lube oils to desired color, demulsibility, neutrality, Conradson carbon, color stability and bloom are admittedly unexcelled.

Super-Filtrol is prepared to meet the most exacting requirements of petroleum engineers, as an adsorbing and decolorizing medium. Produced under the most rigid laboratory and technical control.

Write Dept. O for complete information relating to Filtrol Fractionation (or distillation over Filtrol).



FILTROL— the finest acid activated clay in the world!

FILTROL COMPANY OF CALIFORNIA

1755 DOWNEY ROAD LOS ANGELES, CALIFORNIA

We couldn't have done it in swivel chairs

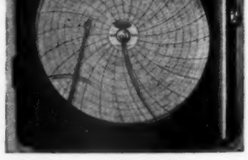
FOR years, one of the toughest problems in the oil industry was that of exact temperature control of stabilizer reboilers.

Three years ago, our engineers put several standard Mason-Neilan Temperature Controllers on reboilers. And frankly, they appeared to be little better than any other instrument.

For weeks, Mason-Neilan development engineers actually lived in gasoline plants . . . seeking the solution . . . trying idea after idea. Finally, they devised the Thermo-Pressure Compensator . . . a radically different scheme which insures exact temperatures by *compensating from the pressure of the heating medium.*

Since then, T.P.C. Temperature Controllers have provided closer temperature control in gas or oil fired stills, on difficult dewaxing hookups and other refinery and gasoline plant applications requiring unvarying temperatures.

This particular Thermo-Pressure Compensated Instrument and all Mason-Neilan Regulators and Controllers, have been developed *in and for* the Oil Industry, by engineers who know its requirements and limitations.



For exact control of pressures, temperatures and rates-of-flow . . . specify Mason-Neilan Control Equipment.

MASON-NEILAN

REGULATOR COMPANY

[*Consolidation of Mason Regulator Co. of Boston and Neilan Co., Ltd., of Los Angeles.*]

1190 Adams Street, Boston, Mass.

BALTIMORE, Whitaker Bldg. . . . . Morton McI, Dukehart & Co.
CHICAGO, 1525 E. 53rd. St. . . . . Gordon Thomsson, Mgr.
HOUSTON, 1400 Conti St. . . . . Maintenance Engineering Corp.
LOS ANGELES, 2446 Enterprise St. . . . . Tunnell & Co.
MONTREAL, CANADA, 620 Cathcart St. . . . . Maurice Peiler, Mgr.
NEW YORK, 19 Rector St. . . . . Rudolph B. Werey, Mgr.
PHILADELPHIA, 930 North Front St. . . . . Basuerle & Morris, Inc.
PITTSBURGH, Clark Bldg. . . . . Bruce Irwin, Mgr.
ST. LOUIS, 2726 Locust Blvd. . . . . O'Brien Equipment Co.
SYRACUSE, N. Y., 640 Gurney Bldg. . . . . O'Brien Steam Specialty Co.
TULSA, 409 East Archer St. . . . . Moorlane Co.

YOU CAN BE SURE OF MASON-NEILAN PRODUCTS

871

TEXAS (Continued)

Company and plant location—	Crude oil cap.	Crack. cap.	Type of refinery	Type of cracking plant
Texas Co., El Paso	1,500	1,500	S-C	Holmes-Manley
Texas Oil Products Co., Gladewater	2,500	.....	S	
Texas Oil Products Co., San Antonio	750	.....	S	
Texas Pacific Coal & Oil Co., Fort Worth	3,000	1,000	T-C-L	Cross
Texas Pacific Coal & Oil Co., Caddo	1,000	.....	T	
Texas Pet. Products Co., Somerset	2,000	.....	S	
Tucker Oil Co., Burkburnett	350	.....	S	
Trico Ref. Co., Turnerstown	200	.....	S	
Trinity Refining Co., Gladewater	2,000	1,000	S-C	Lummus
Tyler Ref. Co., Arp	2,000	.....	S	
Upshur Ref. Co., Gladewater	750	1,250	S	
Upshur Ref. Co., Gladewater	1,000	.....	S	
Utah Ref. Co., Kilgore	200	.....	S	
Union Ref. Co., Camp Switch	3,000	.....	S	
Unit Ref. Co., Kilgore	200	.....	S	
Valley Ref. Co., Harlingen	200	.....	S	
Waggoner Ref. Co., Inc., Electra	6,000	.....	S	
West Texas Ref. Co., Pecos	6,000	4,000	S-C	†Jenkins
White Star Ref. Co., Cisco	500	.....	S	
Wichita Ref. Co., Gladewater	500	.....	S	
Wickett Ref. Co., Wickett	2,000	.....	S	
Total	929,655	464,300		

*Combination topping and cracking under construction.
†Owned by Pecos Refining Co.

UTAH

Jenson Oil Ref. Co.*	1,000	.....	L	Still
Utah Oil Ref. Co., Salt Lake City	6,000	6,500	Comp.	Modified Burton, Holmes-Manley
Wasatch Oil Refining Co., Woods Cross	1,400	900	S-C	Vapor Phase
Total	8,400	7,400		

*Under construction.

VIRGINIA

The Texas Co., Norfolk	2,000	.....	A	

WEST VIRGINIA

Carbide & Carbon Chemicals Corp., South Charleston	1,000	1,000	C	Gyro
Elk Ref. Co., Falling Rock	2,250	.....	Comp.	
Ohio Valley Ref. Co., St. Marys	2,000	750	Comp.	Dubbs
Pure Oil Co., Cabin Creek	3,500	750	S-L-C	Gyro
Standard Oil Co. of N. J., Parkersburg	6,000	13,714	Comp.	Tube & Tank
Tri-State Ref. Co., Kenova	2,500	2,000	S-C	Jenkins
Total	17,250	18,214		

WYOMING

Continental Oil Co., Glenrock	2,500	1,800	S-C	Cross
Egaso Operating Co., Osage	750	.....	S-C	Cross
Goshen Oil Ref. Co., Torrington	250	.....	S	
Gillette Ref. Co., Gillette	100	.....	S	
Midland Oil Ref. Co., Osage	300	.....	S	
Standard Oil Co. (Ind.), Casper	12,600	17,850	Comp.	Vapor Phase
Standard Oil Co. (Ind.), Greybull	5,000	2,500	S-C-A	Cross
Producers & Refiners Corp., Parco	8,000	4,000	S-L-C	Dubbs
The Texas Co., Casper	7,000	6,500	S-C	Holmes-Manley, Pressure Coke
The Texas Co., Calpet	300	.....	S	
White Eagle Oil Corp., Casper	5,000	3,500	Comp.	White Eagle
Star Refinery, Osage	75	.....	S	
Wyoming Gas & Oil Co., Upton	100	.....	S	
Wyoil Refining Co.	250	.....	S	
Total	42,225	36,150		

Shut Down Refineries in the United States

The following tables list the shutdown refineries in the United States as of March 15. The following abbreviations are used: S—skimming; C—cracking; L—lubricating oils; A—asphalt.

ALABAMA

Company and plant location—	Crude oil cap.	Crack. cap.	Type of refinery	Type of cracking plant
Coastal Pet. Corp., Mobile	6,000	.....	S-C	Coastal

ARIZONA

Rio Grande Oil Co., Phoenix	1,000	.....	S	

ARKANSAS

E. M. Tulle Ref., El Dorado	1,000	.....	S	
Houston Oil Co., Camden	3,500	.....	S-C	Dubbs
Union Asphalt Co., El Dorado	2,000	.....	S-C	Union
Total	6,500	.....		

CALIFORNIA

California Northern Oil Co., Coalinga	200	.....	L	
Champion Gasoline Co., Long Beach	3,500	.....	S	
Consolidated Pacific Ref. Co., Santa Fe Springs	1,000	.....	S	
Crescent Oil & Ref. Co., Los Angeles	6,000	.....	S	
East West Ref. Co., Los Angeles	1,000	.....	S	
General Petroleum Corp., Olinda	2,000	.....	S	
Hart Dearing Ref. Co., Fellows	2,500	.....	S	
Hercules Gasoline Co., Los Angeles	5,500	.....	S-C-A	Jenkins

CALIFORNIA (Continued)

Company and plant location—	Crude oil cap.	Crack. cap.	Type of refinery	Type of cracking plant
Orange County Ref. Co., Newport	1,000	.....	S	
Palisades Oil & Ref. Co., Vinvale	3,500	.....	S	
Petroleum Specialties Co., Los Angeles	2,000	.....	S	
Producers Ref. Co., Kern River	500	.....	L	
Richfield Oil Co., Los Angeles	4,000	.....	S	
Richfield Oil Co., Bakersfield	2,000	.....	S	
Rotary Process Ref. Co., Ltd., Bell	3,000	.....	S-C	Rotary
Signal Oil & Gas Co., Hynes	7,000	.....	S	
Sunset Pacific Oil Co., Los Angeles	8,800	.....	S	
Springs Oil & Ref. Co., Santa Fe Springs	500	.....	S	
The Texas Co. (Calif.), Coalinga	500	.....	S	
Union Oil Co. of Calif., Avila	10,000	.....	S	
Vernon Oil Ref. Co., Vernon	2,000	.....	S	
Western States Pet. Corp., Long Beach	5,000	.....	S	
Wilshire Oil Co., Fellows	2,500	.....	S	
Total	73,800	.....		

ILLINOIS

Barber Asphalt Co., Madison	700	.....	A	
Interocean Ref. Co., McCook	5,000	.....	S-L	
Lubrite Ref. Co., Wood River	4,000	2,500	S-C	Dubbs
Total	9,700	2,500		

INDIANA

Portland Oil & Ref. Co., Portland	600	.....	S	
Interstate Gasoline Co., East Chicago	2,500	.....	S	
Total	3,100	.....		

IOWA

MonaMotor Oil Co.	1,500	.....	S	

KANSAS

Grant Oil Co., Augusta	2,500	.....	S	
Richardson Ref. Co., Eldorado	1,500	.....	S	
Total	4,000	.....		

KENTUCKY

Central Prod. & Ref. Co., Bowling Green	600	.....	S	
Great Southern Ref. Co., Lexington	2,500	.....	S-L	
Neha Ref. Co., Lexington	800	.....	S	
Standard Oil Co. of Ky., Louisville	5,000	.....	S-C	Burton
Total	8,900	.....		

LOUISIANA

Great Southern Ref. Co., Ardis	2,000	.....	S	
Red River Ref. Co., Crichton	1,800	.....	S	
Sinclair Ref. Co., Meraux	30,000	.....	A	
Shreveport Ref. Co., Shreveport	500	.....	S	
Gupeco Ref. Co., Inc., Alexandria	600	.....	S	
Williams Refining Co.	400	.....	S	
Total	35,300	.....		

MARYLAND

Interocean Oil Co., Baltimore	7,000	.....	S-C	Leamon

MICHIGAN

Henry H. Cross Co., Muskegon	1,000	.....	S	
Standard Oil Co. (Ind.), Zilwaukee	1,500	.....	S	
Total	2,500	.....		

MISSISSIPPI

Dixie Oil & Ref. Co., Jackson	1,000	.....	S	

MONTANA

American Ref. Co., Great Falls	1,000	.....	S	
Laurel Oil & Ref. Co., Laurel	5,000	.....	S-C	Laurel
Montana Ref. Co., Billings	750	.....	S	
Northwest Stellarine Co., Inc., Shelby	1,500	.....	S	
Round Up Oil & Ref. Co., Butte	200	.....	S	
Yale Oil Corp., Miles City	800	.....	S	
Total	9,250	.....		

NEW MEXICO

Bloomfield Oil & Gas Co., Bloomfield	300	.....	S	
State Oil & Ref. Co., Dayton	2,500	.....	S	
Sullivan Refs., Inc., Dayton	1,500	.....	S	
Total	4,300	.....		

OHIO

Craig Oil Co., Toledo	1,500	.....	S-L	
Rajah Oil & Ref. Co., Youngstown	500	.....	S	
Stellar Ref. Co., Marne	1,000	250	S-C	Leamon
Total	3,000	250		

OKLAHOMA

Associated Petroleum Co., Allen	8,000	.....	S-C	Jenkins
Canfield Oil Co., Yale	400	.....	S-L	
Carter Oil Co., Cartoco	5,000	.....	S	
Century Pet. Co., Tulsa	2,000	.....	S	
Continental Oil Co., Sapulpa	4,000	1,500	S-C	Cross
Crescent Ref. Co., Holdenville	1,000	.....	S	
Empire Oil & Ref. Co., Cushing	5,000	.....	S	Doherty
Gem Refining Co., Oklahoma City	1,000	.....	S	

(Continued on Next Page)

OKLAHOMA (Continued)

Company and plant location—	Crude oil cap.	Crack. cap.	Type of refinery	Type of cracking plant
Gilmer Oil Co., Ringling	1,000	.....	S	
Government Ref. Co., Oklahoma City.	1,000	.....	S	
Huckins Ref. Co., Earlsboro	1,500	.....	S	
Illinois Oil Co., Cushing	3,000	.....	S-C	Donnelly
Imperial Ref. Co., Ardmore	4,000	.....	S-C	Dubbs
Interocean Oil Co., Bristow	3,000	.....	S	
Morgan Pet. Co., Tonkawa	3,000	.....	S	
Omar Refining Co., Garber	4,500	2,500	S-C	Winkler-Koch
Peppers Gasoline Co., Covington	1,000	.....	S	
Producers & Refiners Corp., Blackwell..	2,500	.....	S	
Santa Fe Oil & Ref. Co., Ardmore	5,000	.....	S	
Superior Oil Corp., Grandfield	2,000	.....	S	
Walters Ref. Co., Walters	2,500	.....	S	
York Ref. Co., Oklahoma City	2,000	.....	S	
Total	62,400	4,000		

PENNSYLVANIA

Conewango Ref. Co., Langdale Switch..	2,000	.....	S	
Island Pet. Co., Neville Island	1,000	.....	S-L	
North Penn Ref. Co., Tiona	500	.....	S-L	
Pure-Penn Ref. Co., Clarendon	350	.....	S-L	
Titusville Oil Works, Titusville	1,000	.....	S-L-C	Titusville
Viking Oil Corp., Clarendon	2,000	.....	S-L	
Waverly Oil Works, Coraopolis	4,000	2,000	S-C	Cross
Total	10,850	2,000		

TENNESSEE

Nashville Oil Co., Nashville	500	.....	S	
Urania Pet. Co., Ltd., Memphis	500	.....	S	
Total	1,000	.....		

TEXAS

Active Oil Corp., Arno	1,500	.....	S	
Alamo Ref. Co., Willow Springs	5,000	1,000	S-C	Rousey
Allstate Ref. Co., Thrall	2,500	.....	S	
American Ref. Properties, Wichita Falls	5,000	.....	S-C	Dubbs
Bobrose Oil & Ref. Co., Brownwood	1,000	.....	S	
Capitol Ref. Co., Luling	2,500	.....	S	
Central Ref. Co., Friars Switch	10,000	.....	S	
Crystal Oil Corp., Burkburnett	1,000	.....	S	
Danciger Refineries, Inc., Pampa	6,000	.....	S	
East Texas Ref. Co., Henderson	6,000	.....	S	
Ewno Oil Corp., Luling	2,500	.....	S	
Foster & Co., Denison	600	.....	S	
Four States Ref. Co., Texarkana	700	.....	S	
Freeport Asphalt Co., Freeport	5,000	.....	S-A	
Gilmer Ref. Co., Gilmer	500	.....	S	
Golden West Oil Co., Hondo	150	.....	L	
Great West Ref. Co., Big Spring	5,000	.....	S	
Haskell Oil Ref. Corp.	300	.....	S	
Henderson Ref. Co., Henderson	12,000	.....	S	
Humble Oil & Ref. Co., McCamey	12,000	7,800	S-C	Tube & Tank
Humble Oil & Ref. Co., Breckenridge	1,500	.....	S	
Humble Oil & Ref. Co., Chilton	4,500	.....	S	
Iowa Park Prod. & Ref. Co., Iowa Park.	3,000	.....	S	
Kent Ref. Co., Minerva	2,200	.....	S	
Magnolia Pet. Co., Magpetco	10,000	.....	S	
Magnolia Pet. Co., Fort Worth No. 2	2,600	750	S-C	Controlled Coil
Mid-Tex Ref. Co., Midland	2,500	.....	S	
Macmillan Pet. Corp., Borger	8,000	.....	S	
Moon Ref. Co., Graham	600	.....	S	
Motor Fuels Products Co., Laredo	2,000	.....	S-C	Jenkins
Nacogdoches Ref., Inc., Nacogdoches	500	.....	S-L	
Norgold Ref. Co., Olney	1,000	.....	S	
Petroleum Conversion Corp., Texas City.	3,000	.....	C	T.V.P.
Danciger Refineries, Inc.	15,000	.....	S	
Primrose Ref. Co., Wichita Falls	2,500	.....	S	
Richardson Ref. Co., Big Spring	7,500	.....	S-C	Jenkins
Seymour Ref Co., Seymour	250	.....	S	
Superior Ref. Co., Tiffin	2,000	.....	S	
Sweetwater Oil & Ref. Co., Sweetwater.	1,000	.....	S	
Texas Mexican Oil & Ref. Co., Laredo	800	.....	T-L	
Tonkawa Pet. Co., Pyote	4,000	.....	S	
Western Oil Corp., Burkburnett	3,000	.....	S	
Wilcox, H. F., Oil & Gas Co., Pampa	3,500	.....	S	
Young Ref. Co., Archer City	250	.....	S	
Total	161,950	9,550		

UTAH

Diamond Oil Co., Virgin	250	.....	S	

WASHINGTON

Inland Empire Ref. Co., Parkwater	500	.....	S	
Spokane Oil & Ref. Co., Hillyard	1,000	.....	S	
Total	1,500	.....		

WYOMING

Alliance Oil & Ref. Co., Thermopolis	1,500	.....	S	
Eclipse Oil & Ref. Co., Newcastle	40	.....	S	
Lovell Ref. Co., Lovell	600	.....	S	
Standard Oil Co. (Indiana), Laramie	2,500	.....	S-C	Burton
The Texas Co., Cody	3,000	1,500	S-C	Holmes-Manley
Total	7,640	1,500		

Personnel Refineries in Canada

B

British-American Oil Refineries, Ltd., Royal Bank Bldg., King and Young Sts., Toronto, Canada

Pres., A. L. Ellsworth
V. P., C. L. Suhr
Mgr., L. E. Wooly
Refineries located at Moose Jaw, Saskatchewan; Coutts, Alberta; Toronto, Ontario, and Montreal, East Quebec

Bell Refining Co., Ltd., 1202 First St., West, Calgary, Alberta, Canada

Pres., A. G. Spooner
V. P., R. A. Brown
Sec. and Treas., R. E. Donaldson
Mgr. Dir., F. J. Huff
Gen. Supt., Maurice Stevens
Refinery located at Calgary, Alberta

C

Canadian Oil Companies, Ltd., 12 Strachan Ave., Toronto, Ontario, Canada

Pres., F. B. Fretter
V. P., F. H. Littlefield
Sec., H. F. Hoecker
Treas., F. C. West
Gen. Supt., C. A. Hale
Tank Car S. M., F. C. West
Ch. Chem., E. A. Smith
Pur. Agt., G. S. Middaugh
Traf. Mgr., C. E. Wilfong
Refinery located at Petrolia, Ontario

E

Excel Refineries, Ltd., Weyburn, Saskatchewan, Canada

Pres., E. Wisland
Sec. and Treas., O. W. Harvey
Refinery located at River Side Park Subdivision, Weyburn, Saskatchewan

H

Hi-Way Oil Co., Ltd., P.O. Box 291, New Westminster, British Columbia, Canada

Dirs., E. M. C. McLorg, G. H. Wheelhouse
Gen. Mgr., Wm. L. Mackenzie
Gen. Supt., Edward Neil
Station S. M., W. S. Lench
Pur. Agt., Wm. L. Mackenzie
Refinery located at South Westminster, British Columbia

Home Oil Distributors, Ltd., 555 Burrard St., Vancouver, British Columbia, Canada

Pres., W. J. Blake Wilson
V. P., Austin C. Taylor
Sec. and Treas., W. W. Boultbee
Gen. Mgr., H. G. Fowler
Gen. Supt., Duncan Fraser
Tank Car S. M., L. J. Martin
Station S. M., C. Shepherd
Ch. Chem., A. Rees
Pur. Agt., S. F. Barbour
Refinery located at North Vancouver, British Columbia

I

Imperial Oil, Ltd., 56 Church St., Toronto, Ontario, Canada

Pres., G. H. Smith
V. P.s, Victor Ross, C. A. Eames, R. V. LeSueur
Dirs., G. H. Smith, Victor Ross, C. A. Eames, R. V. LeSueur, L. C. McCloskey, J. McNeil
Sec. and Treas., F. E. Holbrook, Sarnia, Ontario
Dir. Mfg., L. C. McCloskey
Gen. Supt., Charles Leaver
Supts., A. D. Grant, Ioco, Britsh Columbia; C. M. Moore, Calgary, Alberta; C. E. Carson, Regina, Saskatchewan; G. L. Stewart, Sarnia, Ontario; F. C. Mechin, Montreal, Quebec; R. L. Dunsmore, Dartmouth, Nova Scotia.
Asst. Supts., E. E. Dauphinee, Ioco, British Columbia; J. J. Hanna, Calgary, Alberta; C. R. Moore, Regina, Saskatchewan; J. J. McCarthy, Montreal, Quebec; R. D. King, Dartmouth, Nova Scotia
Dir. of Sales, J. McNeil
Ch. Egr., T. Montgomery, Sarnia, Ontario
Ch. Chem., Gordon McIntyre, Sarnia, Ontario
Ch. Research Chem., Dr. R. K. Stratford, Sarnia, Ontario
Pur. Agt., L. E. Bury, Toronto, Ontario
Traf. Mgr., W. H. Dickie
Refineries located at Ioco, British Columbia; Calgary, Alberta; Regina, Saskatchewan; Sarnia, Ontario; Montreal, Quebec, and Dartmouth, Nova Scotia

M

McColl-Frontenac Oil Co., Ltd., Royal Bank Bldg., Montreal, Quebec, Canada

Pres., John Irwin
V. P.s, P. A. Thomson, J. A. Wales, J. M. Pritchard, S. S. Griffiths, H. H. Bradburn, A. J. Nesbitt, Brig. Gen. J. B. White, Hon. Walter Mitchell, Gordon Perry, John Irwin
Sec., Fred Hunt
Treas., L. A. Brooks
V. P. in chg. Operations, J. A. Wales
Supts., J. D. Brown, Montreal, Quebec; C. B. W. Anderson, Toronto, Ontario
Asst. Supts., L. W. McClaran, Montreal, Quebec; R. F. Dimmitt, Toronto, Ontario
V. P. in chg. Sales—J. M. Pritchard
Ch. Chem., G. R. Taylor
Ch. Egr., R. C. Kinzer
Pur. Agt., B. F. Stanton
Traf. Mgr., V. Smith
Refineries located at Montreal, Quebec, and Toronto, Ontario

R

Regal Petroleum Co., Ltd., 314 Insurance Exchange Bldg., Calgary, Alberta, Canada

Pres., Frank P. Book
V. P.s, A. E. O'Brien, E. L. Harvie
Sec., E. L. Harvie
Treas., A. E. O'Brien
Supt., B. J. Manley
Tank Car S. M., H. E. McDonald
Station S. M., H. E. McDonald
Ch. Egr., B. J. Manley
Ch. Chem., J. Shanahan
Pur. Agt. and Traf. Mgr., F. R. Carey
Refinery located at Calgary, Alberta

S

Shell Oil Co. of British Columbia, Ltd., Vancouver, British Columbia, Canada

Pres., G. Legh-Jones
V. P.s, S. Belither, C. E. Anstie
Sec., G. E. McKinnon
Treas., D. Heggie
Supt., C. M. Dean, Burnaby, British Columbia
Refinery located at Burnaby, British Columbia

Shell Oil Co. of Canada, Ltd., Toronto, Ontario, Canada

Pres., P. M. Fowlie
Sec. and Treas., O. B. Roger
Supt., F. S. Clulow, Montreal, Quebec
Asst. Supt., D. M. Morrison, Montreal, Quebec
Tank Car S. M., J. A. Adamson
Station S. M., H. W. Wilson
Ch. Egr. Sales, P. R. Reynolds
Ch. Egr. Refinery, R. G. Blackburn
Ch. Chem., E. C. Wilkinson
Pur. Agt., P. E. Clayton
Traf. Mgr., C. F. Pryce
Refinery located at Montreal, Quebec

Operating Refineries in Canada

Abbreviations: S—Skimming; C—Cracking; A—Asphalt; Comp.—complete, includes all the principal products secured from petroleum.

Company and plant location—	Crude oil cap.	Crack. cap.	Type of refinery	Type of cracking plant
ALBERTA				
Imperial Oil, Ltd., Calgary	5,000	3,800	Comp.	Tube & Tank
Regal Petroleum Co., Ltd., Calgary	3,000	.....	S	
British-American Oil Co., Ltd., Coutts	1,500	1,500	S-C	Dubbs
Bell Refining Co., Ltd., Calgary	500	.....	S	
Lion Refining Co., Calgary	250	.....	S	
Maple Leaf, Ltd., Coutts	5,000	.....	S	
Total	15,250	5,300		
BRITISH COLUMBIA				
Hi-Way Oil Co., Ltd., South Westminster	240	.....	S	
Home Oil Distributors, Ltd., North Vancouver	1,000	.....	S	
Imperial Oil, Ltd., Ioco	16,000	3,600	Comp.	Tube & Tank
Shell Oil Co. of British Columbia, Ltd., Burnaby (Vancouver)	3,500	.....	S	
Total	20,740	3,600		
MANITOBA				
North Star, Ltd., Winnipeg	500	.....	S	
Radio Refs., Winnipeg	1,000	.....	S	
Total	1,500	.....		
NOVA SCOTIA				
Imperial Oil, Ltd., Dartmouth	17,000	6,000	Comp.	Tube & Tank Burton
NORTHWEST TERRITORIES				
Imperial Oil, Ltd., Fort Norman	50	.....	S	
ONTARIO				
Canadian Oils Cos., Ltd., Petrolia	1,000	.....	S-L	
Imperial Oil, Ltd., Sarnia	22,000	14,600	Comp.	Tube & Tank
McColl-Frontenac Oil Co., Ltd., Toronto	5,000	3,200	S-C	Jenkins, Gyro
British-American Oil Co., Ltd., Toronto	8,000	3,000	S-C	Own
British-American Oil Co., Ltd., Montreal	15,000	5,000	S-C	Own
Simrall Ref. Corp., Amherstburg	2,500	.....	S	
Total	53,500	25,800		
QUEBEC				
Imperial Oil, Ltd., Montreal	30,000	8,000	Comp.	Tube & Tank
McColl-Frontenac Oil Co., Ltd., Montreal	5,000	3,200	S-C	Jenkins, Gyro
Shell Oil Co. of Canada, Ltd., Montreal	3,500	3,000	S-C	Dubbs
LaSalle Petroleum Co., Montreal	3,000	.....	S	
Total	41,500	14,200		
SASKATCHEWAN				
Imperial Oil Co., Ltd., Regina	6,500	3,300	Comp.	Tube & Tank Burton
British-American Oil Refineries, Ltd., Moose Jaw	700	.....	S	
Crow Oil Co., Ltd., Weyburn	300	.....	S	
Excel Refs., Ltd.*	300	.....	S	
Karels Oil Refinery, Regina	175	.....	S	
Total	7,975	.....		

*Plant under construction.

Canadian Motor Fuel Tax Outweighed Refinery Manufacturing Economies

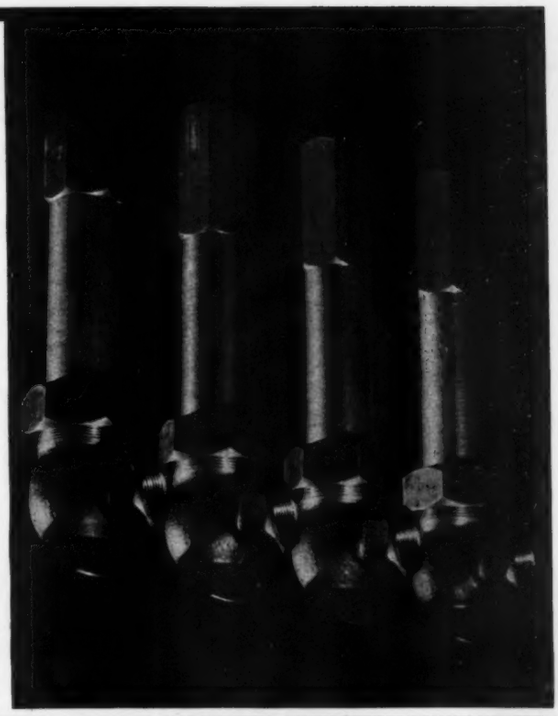
TORONTO, Ontario, Mar. 26.—Figures compiled by Imperial Oil, Ltd., indicate the important bearing of gasoline taxation on the cost of motor fuel to the ultimate consumer.

Figures covering the period from 1920 to 1932 show that the manufacturing expense per gallon of gasoline, above the cost of crude oil, declined from 20½ cents in 1920 to 6½ cents in 1932. In the same period the wholesale distribution expense dropped from 8½ cents to 6½ cents. Thus these two main elements of cost controllable by the refining companies has decreased from 29 cents a gallon in 1920 to 13 cents in 1932. The 1933 figure on examination will probably be found still lower.

A new and uncontrollable element affecting the prices charged the consumer first entered in 1924 with the imposition of the first provincial gasoline tax. The initial tax was one-half cent a gallon; but since then it has rapidly increased to a maximum of 7 cents in some provinces, though 5 cents was the ruling figure in 1932.

Refining companies point out that the steady increase in gasoline taxes has deprived the Canadian consumer of the benefit of reduced manufacturing and distributing costs since 1924. The reduction in costs from 1924 to 1932, inclusive, would be around 6¼ cents per gallon; but this is offset by the increased tax. Consequently the cost of gasoline to the consumer in 1932 was about the same as in 1925, though the spread between the price of crude oil and the wholesale price of gasoline was only 13.3 cents a gallon in 1932 compared with 16.7 cents in 1925.

Edward



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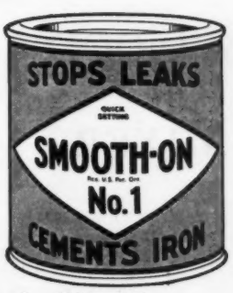

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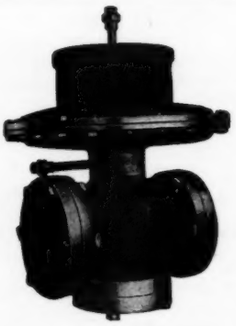

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Refiners in Mexico Increasing Efficiency of Their Plants Rather Than Adding to Crude Capacity

By C. O. WILLSON

In line with the trend in other sections of the oil world, operators of refineries in Mexico are improving their plants with the view of securing greater efficiency and better products rather than adding to capacity. This trend which has been under way for the past five years has resulted in plants which are comparable in plant equipment to those of the United States and other countries.

The equipment installed in the early twenties when a rapidly increasing crude oil production brought a corresponding expansion in refinery facilities, has been largely junked. At that time with Mexican crude oil production approximating 300,000 bbls. daily there were two plants each with a rated capacity in excess of 100,000 bbls. daily. These plants consisted of long batteries of shell stills. The operation was largely topping, the tops being sent to refineries in the United States to secure finished products. The main object of the operation was to secure large yields of bunker fuels from the relatively low gravity crudes.

This operating situation has gradually changed. Pipe stills have replaced the shell stills to a large extent and cracking facilities have been added. Operations have been made flexible in order to secure the products for which there is an export and domestic demand. The domestic demand for petroleum products is limited in Mexico but oil companies are aiding materially in changing this situation by making their products available in all the population centers. At this time the domestic outlet not including bunker fuels absorb approximately one-third of the crude oil available.

As shown in the accompanying table the nine refineries in Mexico have a total rated crude oil capacity of 91,200 bbls. daily. It happens that this is approximately equal to the present crude oil production of the country which totaled 91,600 bbls. daily in 1933. The refineries do not absorb all of this crude oil, the runs to stills of refineries at this time being approximately 55,000 bbls. daily with a daily average of 56,300 bbls. in 1933. The remainder of the crude oil is exported or consumed for fuel without being subjected to any refining operation.

Refinery Yields

A government report for last year showed the following average yields of refinery products based on operations covering several months: Fuel oil, 53 per cent; gas oil, 9 per cent; crude gasoline, 6.5 per cent; refined gasoline, 15.8 per cent; crude kerosene, 2.2 per cent; refined kerosene, 2.6 per cent; lubricants, 1.7 per cent; crude paraffin, .1 per cent; refined paraffin, .4 per cent; asphalts, 2.9 per cent; cokes, .06 per cent; sundry products, 2.8 per cent. These yields show that the production of heavy products is still the main phase of refinery operations. While the bulk of the crude oil comes from two fields there is sufficient scattered production to give a variety in quality of oil which enables refiners to obtain practically all products. Some crude oil is imported, the imports in 1933 totaling a little less than 1,000 bbls. daily.

At one time, the bulk of the exports from Mexico went to buyers in the United States. The imposition of the import taxes in the United States in 1932 has shut off all importation of light end products and has reduced the outlets for heavy oils. As a result, refiners have been forced to find other markets which includes the West Indies, South America and European countries. This development has helped in forcing refinery owners to modernize their plants so that they could secure products from their crudes in line with marketing requirements.

The following table gives the exports from Mexico for 1933:

	Bbls.
Heavy crude oil	10,233,000
Light crude oil	138,000
Fuel oil	5,621,000
Gas oil	1,125,000
Gasoline	1,986,000
Kerosene	543,000
Lubricants	347,000
Asphalt	841,000
Total	20,834,000

Refineries

The refinery operations of three companies account for practically all of the plant output in Mexico. Four concerns operate four small plants. These plants are not operated consistently and only serve a local trade. One of these concerns—Control de Administracion de Petroleo—is controlled by the government. Its plant at Tampico has a rated crude oil capacity of 500 bbls. daily. The government recently announced its intention to enlarge this plant and also enter more extensively into the marketing of petroleum products in Mexico. It was claimed that Mexican consumers are charged exorbitant prices at many points.

Compania Mexicana de Petroleo "El Aguila" S. A. is the most important refinery operator in Mexico, its three plants having a combined crude oil capacity of 61,000 bbls. daily. This company, which is a Dutch-Shell subsidiary, is also a large producer of crude oil in Mexico and has distributing facilities throughout the country. The two plants in the State of Vera Cruz have terminals on the Gulf of Mexico and are important units in the Shell operations covering the entire world.

The plant at Mexico City serves the trade centering around the Mexican capital.

All three of these plants have been modernized over the past two years. The cracking facilities at Tampico have a capacity of 2,000 bbls. of finished gasoline daily. The unit at Minatitlan is capable of producing 1,200 bbls. of finished gasoline daily. The skimming equipment at all three plants consists of modern tubular stills and fractionating towers.

The Huasteca Petroleum Co. came under the direction of the Standard Oil Co. of New Jersey two years ago when the company purchased all the foreign properties of the Pan American Petroleum & Transport Co. The Huasteca company is now a subsidiary of the Mexican Petroleum Co., Ltd., a unit of the Pan American Petroleum Corp., the holding corporation of New Jersey Standard for all the former foreign properties of the Pan American company. The main offices of the company are located at the Standard of New Jersey headquarters, New York City, and the general operations of the Mexican subsidiary are directed from that point.

About a year ago the Huasteca company completed a 5,000-bbl. cracking unit at the Tampico refinery and the plant now has a well balanced operation for the manufacture of light end products and heavy fuels. Other phases of the plant operation were improved at the time the cracking unit was installed. This company also has crude oil production in Mexico.

The plant of the Pierce Oil Co., S.A., at Tampico came under the control of the Sinclair interests at the time they took over all the Pierce properties in the United States. The Pierce company was one of the early operators in Mexico and the plant at Tampico is the oldest plant now operating. The Pierce operations are complete except for cracking. The company manufactures lubricating oils and has a large distribution of products in Mexico. A new skimming unit is now being installed replacing the equipment which was damaged by hurricane and flood last September.

Survey of Operating Refineries in Mexico

Company and location—	Daily crude capacity	Cracking capacity	Type of plant
Jose P. Cavazos and Alfredo Fernandez, North Laredo, Tamaulipas	100	.....	S-A
Cia Mexican de Petroleo, S. A., Ebano, Vera Cruz	500	.....	S-A
Compania Mexicana de Petroleo, "El Aguila," S. A.:			
Tampico, Vera Cruz	25,000	4,000	S-C-A
Minatitlan, Vera Cruz	31,000	2,500	S-C-A
Mexico City	5,000	.....	S
Control de Administracion de Petroleo Nacional, Tampico, Vera Cruz	500	.....	S-A
Enrique Resendez, North Laredo	100	.....	Experimental
Huasteca Petroleum Co., Tampico, Vera Cruz	18,000	5,000	S-C-A
Pierce Oil Co., S. A., Tampico, Vera Cruz	11,000	.....	S-L-A
Total	91,200	11,500	

Type of plant: S—skimming and topping; A—asphalt; C—cracking; L—lubricating oil.

Personnel of Refining Organization in Mexico

Cia Mexicana de Petroleo, S. A., Bucareli 35, Mexico City, W. E. McMahon representative. This company is affiliated with Huasteco Petroleum Co. Small plant located in the Ebano Field, northwest of Panuco and Tamesi River Valleys.

Compania Mexicana de Petroleo, "El Aguila," S. A. (Mexican Eagle Oil Co., Ltd. Dutch-Shell), Avenida Juarez, 92-94, Mexico City. J. A. Assheton, president; Luis Riba, F. M. Davies, G. J. Rennow, vice presidents; P. J. Jonker, secretary; H. F. Garraway, controller; H. W. Sanson, refinery sales manager; H. E. Hickman, domestic sales manager; G. G. Roberts, manager of Tampico refinery; V. Skala, superintendent of Minatitlan refinery; S. Wraight, superintendent of Mexico City refinery; C. J. Crawford, chief engineer; A. E. Hagberg, purchasing agent. Refineries located at Tampico, Minatitlan and Mexico City.

Control de Administracion de Petroleo Nacional, Calle de Colon 41, Mexico City. This company controlled by the Mexican government. It operates a small plant at its Bella Vista terminal in the Port of Tampico.

Jose P. Cavazos and Alfredo Fernandez, Calzada Francisco I. Madero 616, Nuevo Laredo, Tamps. Partnership operating small plant at Nuevo Laredo, Tamaulipas.

Huasteca Petroleum Co. (Mexican Petroleum Co., Ltd.-Pan American), Capuchinas 42, Mexico, D. F. R. G. Stewart, president; F. H. Kay, S. W. Chambers, Harold Walker, L. L. Anderson, P. H. Harwood, R. W. Olinger, vice presidents; R. P. Resor, treasurer; M. H. Eames, secretary; L. L. Anderson, general manager; P. J. Kelly, plant manager. Refinery located at Tampico.

Meza Moreno Teodoro, San Juan de Letran 24, Mexico City. Adalbert F. Smithers, representative. This concern operates a small refinery in Paciencia y Aguacate, near the Panuco River. Plant at present is shut down.

Pierce Oil Co., S. A. (Consolidated Oil Corp.-Sinclair), Calle de Balderas 55, Mexico City, D. F. Gayle A. Steele, president and general manager; F. C. Randall, H. A. Stendrup, vice presidents; M. H. Anthoni, secretary; S. C. Dysart, treasurer; D. D. Freeborn, sales manager; E. A. Kerwin, plant superintendent; A. Silverberg, chief chemist; E. T. Adams, purchasing agent.

Handling Gasoline in "Any Old Boat" Declared Peril

WASHINGTON, D. C., Mar. 26.—Appearing as associate counsel for the Port of New York Authority at a public hearing on the proposed code for the inland waterway oil trade, Wilbur Laroe, Jr., declared gasoline was handled promiscuously by inadequate boats in New York Harbor. He said the unregulated handling of gasoline by "almost any old boat" in a congested area containing 10,000,000 people is dangerous and should be prohibited.

Numerous instances where explosions have occurred due to the inadequacy of vessels and to lax inspection were cited by Billings Wilson, assistant general manager of the port authority. He supported a provision in the code which would compel carriers of gasoline in bulk to obtain a certificate of safety from the American Bureau of Shipping before engaging in this service.

Joseph B. Weaver, NRA deputy administrator, expressed the opinion that some provision of this kind is vitally necessary and suggested that a subcommittee be appointed to co-operate with the American Bureau of Shipping in order to devise regulations that are suitable for this trade.

Charles T. Heitz, chief inspector of motor fuels for New Jersey, gave illustrations of so-called "bootlegging" of gasoline in New York Harbor. He said some boats are equipped with concealed tanks.

The code was presented by Major J. Hervey Ross, on behalf of the coastwise and Inland Water Petroleum Carriers Association, claiming to represent 80 per cent of the trade in the eastern division of the United States.

E. G. Riley, representing a group of association members, protested that the code did not reflect the desires of a substantial part of the trade, and that its proposed schedules of vessel classification and rates discriminated against self-propelled vessels and would result in "a virtual monopoly" by the owners of non-propelled vessels. He proposed complete changes in the capacity classifications of both types of carriers.

H. K. Brunck, representative of the labor advisory board, led the attack upon the labor provisions and in proposing substitution of a 40-hour week for the proposed 48-hour schedule for shore labor. He was sustained by Deputy Administrator Weaver.

Unusual Characteristics of Michigan Crudes Call for Special Refinery Processing Methods

By CLYDE A. CROMWELL
Old Dutch Refining Co.

Without doubt, Michigan crudes are in a separate class in regard to their properties from a refining standpoint. It is therefore the purpose of this paper to deal with the characteristics and refining methods used to process these crudes.

The State of Michigan is rapidly becoming a principal oil producing state; at the present time, its daily potential production is approximately 125,000 bbls.

There are three principal oil producing areas in the State, namely the Mount Pleasant Field, now producing 120,000 bbls. daily, Muskegon, 1,000 bbls. and Hart, 500 bbls. The Muskegon Field was brought in during the fall of 1928, the Mount Pleasant Field a few months later and the Hart Field in 1933. In 1929 the production from the Muskegon Field was about 40,000 bbls. daily, and has dropped to a low of 1,000 bbls. at the present time.

The main producing sands in Michigan are the Dundee, lower and upper Traverse. The greater production is from the Dundee sand.

The gasoline made from these crudes are all bad knockers with the exception of that from the Hart area; this gasoline ranks with Mid-Continent straight-run. Gasoline from the Muskegon crude is the worst knocker. The octane rating on that gasoline is lower than that made from Pennsylvania crude. Curve 1 shows the relation between octane number and various endpoint gasoline made. Straightrun gasolines of this type are not very suitable as motor fuels in the modern car. A 350 endpoint gasoline from Mount Pleasant crude makes only a passable third grade motor fuel.

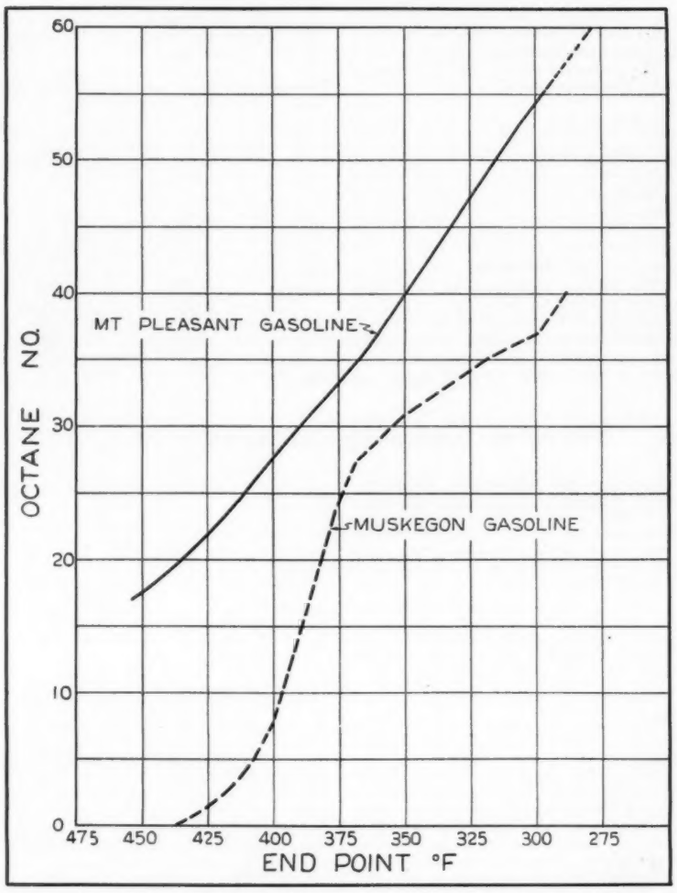
Cracking is the only alternative to make a good gasoline from a Michigan crude, but even this does not give entirely satisfactory results.

In view of the facts above, the majority of Michigan refiners resorted to the manufacture of industrial naphthas. In order to present a complete picture of these crudes, the author will show in detail the analyses of the crudes and products.

Analyses of Crudes

It is evident that these crudes are of the paraffin base type, although Muskegon residue has a fairly low pourpoint. This feature is accounted for on the basis of the low asphaltic content, and this asphaltic matter has the effect of producing a colloidal suspension that prevents the chilling out of the paraffin. These crudes contain hydrogen sulphide, and this compound further adds to the refining problem.

As will be noted, the Muskegon crude contains nearly 1 per cent sulphur.



Curve 1.—Antiknock characteristics of gasoline made from two important Michigan crudes

Mount Pleasant Crude

Curve 2 is a standard column analysis of Mount Pleasant crude.

MOUNT PLEASANT CRUDE PROPERTIES

Gravity	41.6 A.P.I.
Sulphur	0.2%
Pourpoint	Below 0° F.
Tar No.	4
Color	Green

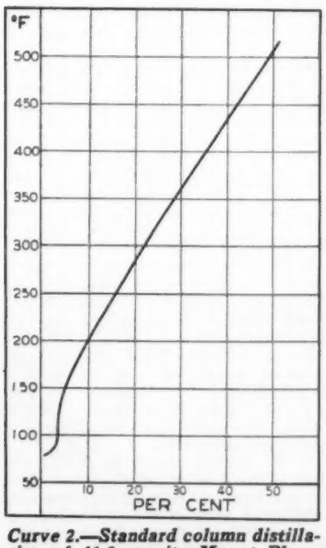
Yields based on running for 350 endpoint gasoline:

	Per cent
Gasoline	25
Kerosene	20
Distillate	10
Gas oil	15
Bottoms	29

In Table 1 are typical A.S.T.M. distillations on above products.

TABLE 1—DISTILLATION OF TYPICAL PRODUCTS MADE FROM MOUNT PLEASANT CRUDE

	Gasoline	Kerosene	Distillate	Gas oil	Bottoms
Gravity	68.8	47.8	41.4	32.6	21.0
I.B.P.	85° F.	353	473	548	....
5 per cent	113	376	485	586	....
10 per cent	135	383	493	597	....
20 per cent	167	391	502	615	....
30 per cent	192	398	509	629	....
40 per cent	216	406	516	639	....
50 per cent	234	415	524	650	....
60 per cent	253	425	532	663	....
70 per cent	271	437	542	677	....
80 per cent	292	453	552	695	....
90 per cent	316	475	569	731	....
95 per cent	339	495	581	...	....
M.E.P.	350	519	596	...	....
Recovery	96%	98.5	98	...	....
Cloud	...	—50	+18	+43	....
Pourpoint	...	—60	+10	+35	+80
Flashpoint	...	142 Foster	260	340	465
Firepoint	...	...	285	360	515
Viscosity	...	...	...	...	1116 @ 100 S.U.
Sulphur	...	...	...	...	0.42%



Curve 2.—Standard column distillation of 41.6 gravity Mount Pleasant crude

Analysis of Muskegon Crude

Curve 3 was plotted for standard column analysis of Muskegon crude. Muskegon crude has the following properties:

Gravity	38.0 A.P.I.
Sulphur	0.39%
Pourpoint	Below 0° F.
Tar No.	10
Color	Black

Yields based on 350 endpoint gasoline:

	Per cent
Gasoline	22
Kerosene	18
Distillate	10
Gas oil	15
Bottoms	32.5

The A.S.T.M. distillations show practically the same boiling ranges on the various product as Mount Pleasant crude, but for the same endpoint have lower gravities. Gravity relationships between the three crudes are shown in Curve 5. The results are shown in Table 2.

Curve 4 is a standard Hempel analysis of Hart crude.

PROPERTIES OF HART CRUDE

Gravity	36.6 A.P.I.
Sulphur	0.32%
Pourpoint	Below 0° F.
Tar No.	10
Color	Black

Yields based on 350 endpoint gasoline:

	Per cent
Gasoline	25.0
Kerosene	18.4
Distillate	5.0
Gas oil	19.8
Bottoms	30.5

Analysis of Hart Crude

The octane rating on Hart gasoline is very similar to Mid-Continent; on 350 endpoint gasoline the octane rating is 58; for 400 endpoint gasoline is 49.

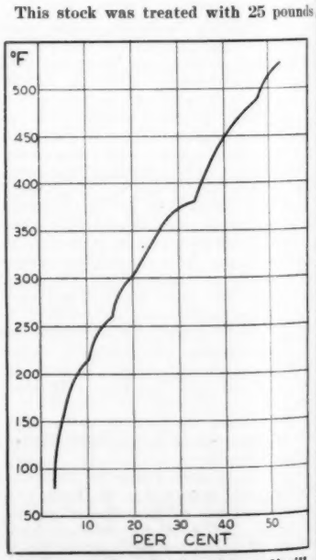
Lubricating Oil Values

Mount Pleasant crude produces lubricants of high quality. Untreated Mount Pleasant steam refined stock has the following properties:

UNTREATED STOCKS

Per cent of crude	16.9
Viscosity @ 210° F.	151
Carbon residue	6.1%

This stock was treated with 25 pounds



Curve 3.—Standard column distilling 38.3 gravity Muskegon crude

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Photo thru courtesy of Daily Oklahoman and Oklahoma City Times

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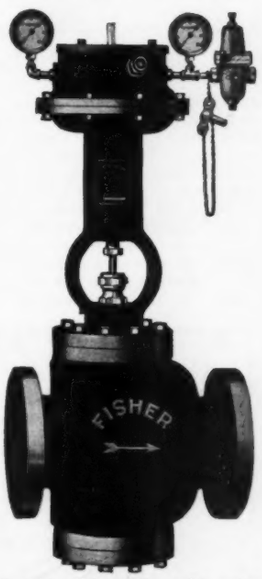
Fisher Series 4200 WIZARD Control is the most modern, accurate, air actuated pressure controller. Simple and sturdy in construction, easily adjusted. Available with pilot as an integral part of the main valve, as shown at right; or with panel board type of pilot for remote control. For either pressure reducing or pressure relief service and for all pressures from 5 to 500 pounds.



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NRA MEMBER U.S. WE DO OUR PART

per barrel of 98 per cent sulphuric acid, neutralized and filtered through Filtrol.

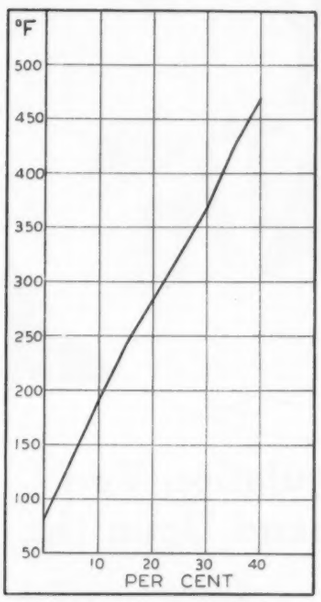
TREATED STOCKS

Per cent of crude	12.7
Viscosity @ 210° F.	136
Carbon	3.3%
Gravity	21.1 A.P.I.
Flashpoint	585° F.
Firepoint	635
Cold test	+60

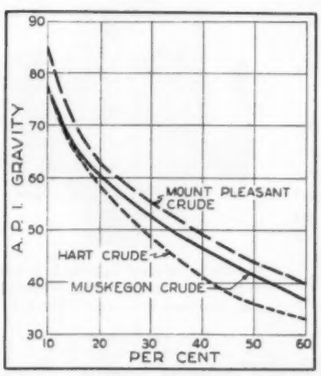
In order to determine the viscosity relationship versus the yield of bottoms, Curve 6 was drawn and is included here.

Solvents

In the past few years petroleum solvents have found extensive use in the industry. Manufacturers who used coal tar naphthas and other high priced solvents found that petroleum solvents could be used to give them the desired quality in their products. At the present time a great deal of rubber solvent naphtha is in use in the manufacture of rubber cements. Varnish makers and painters naphtha is employed extensively as a thinner in varnish and paints. Stoddard solvent finds a wide use as a cleaning solvent in the dry cleaning industry.



Curve 4.—Hempel distillation of Hart, Michigan, crude



Curve 5.—Gravity relationship among fractions in three Michigan crudes

There are many more industries that employ certain cuts of petroleum naphthas. In the following paragraph naphthas from Mount Pleasant crude and their properties will be discussed.

At this plant all naphthas are made from a rerun distillation in order to treat successfully the finished naphtha. Naphtha users are very strict in regard to sulphur specifications. Many customers of naphthas require a special corrosion test, namely, the placing of a polished copper strip in flask and proceeding with the usual A.S.T.M. distillation test; at the end of the test the strip must show but a slight discoloration.

Following is a typical A.S.T.M. distillation on Mount Pleasant naphtha stock that is charged to the rerun battery:

NAPHTHA DISTILLATE

Gravity	62.9 A.P.I.
I.B.P.	92
5 per cent	134
10 per cent	157
20 per cent	195
30 per cent	228
40 per cent	256
50 per cent	284
60 per cent	310
70 per cent	339
80 per cent	388
90 per cent	392
95 per cent	415
Endpoint	420
Recovery	96%

The following yields are obtained from the above naphtha stock:

YIELDS

	Per cent
Rubber solvent	40
V.M.&P.	15
Stoddard solvent	35
Bottoms	6
Loss	4

The A.S.T.M. distillations and properties of these solvents are as follows:

PROPERTIES OF SOLVENTS

	Rubber solvent	V.M.&P.	Stoddard solvent
Gravity	72.0	59.7	53.5
I.B.P.	96° F.	212	308
5 per cent	123	235	320
10 per cent	136	240	323
20 per cent	154	245	327
30 per cent	168	250	330
40 per cent	179	256	334
50 per cent	188	260	338
60 per cent	200	264	342
70 per cent	208	270	346
80 per cent	220	276	353
90 per cent	236	284	361
95 per cent	250	290	368
Endpoint	292	322	398

TABLE 2—A.S.T.M. DISTILLATIONS ON PRODUCTS FROM MUSKEGON CRUDE

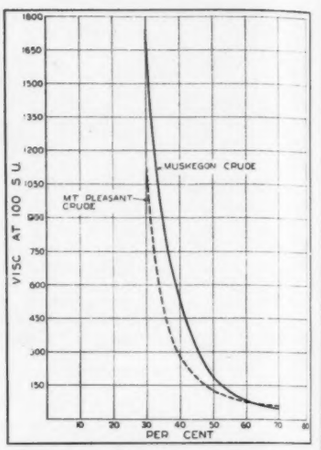
	Gasoline	Kerosene Distillate	Gas oil	Bottoms
Gravity	64.5	44.3 37.1	32.2	19.3
I.B.P.	95° F.	340 479	534	....
5 per cent	126	367 499	573	....
10 per cent	145	373 503	586	....
20 per cent	165	385 510	601	....
30 per cent	185	393 513	613	....
40 per cent	203	404 517	623	....
50 per cent	219	415 520	634	....
60 per cent	234	427 525	649	....
70 per cent	250	440 531	665	....
80 per cent	267	455 539	685	....
90 per cent	287	477 552	715	....
95 per cent	312	492 566	...	....
Endpoint	349	516 591	...	....
Recovery	97%	98.5 98	...	....
Cloud	...	—34 +8	+66	....
Cold	...	—40 0	+60	+105
Flashpoint	...	140 Foster 270	335	500
Firepoint	...	... 295	355	560
Viscosity	...	... ...	...	122 @ 122 Furol
Sulphur	...	... ...	...	0.6%
Recovery		98%	99.5	99
Color		30	30	30
Sulphur		.0032%	.0045%	.021%
Solvency		35 K.B.	32	30
Fl.-Tag closed		...	...	105
Aniline No.		135	134	146

Sulphur Problem

It is well at this point to consider the treating of products from these crudes. Muskegon crude with its high sulphur content is the most troublesome. As stated previously all of these crudes evolve hydrogen sulphide gas on distillation. Since this gas is a very corrosive one, it is necessary to introduce anhydrous ammonia into our fractionating tower to minimize corrosive effects.

The presence of ammonia also removes to a large extent the hydrogen sulphide from the oil thus preventing the oxidation of this gas to free sulphur. $2H_2S + O_2$ gives $2H_2O + 2S$. In order to treat the gasoline at this plant we employ the usual sodium plumbite method. The resulting lead sulphide is recovered by the usual regeneration process using steam and air. In order to obtain a better lamp test on kerosene, a small quantity of 66 acid is used; the kerosene is then neutralized and sweetened with sodium plumbite. A characteristic of the gasoline of these crudes on sweetening with plumbite is that they tend to emulsify, and in order to prevent this emulsification careful control is exercised when sweetening the plumbited oil with flowers of sulphur. It is a well known fact that when an oil is sweetened with plumbite and sulphur, disulphides are formed, and upon redistilling a gasoline so treated will form hydrogen sulphide, free sulphur and mercaptans. Since these reactions occur it would be impossible to make naphthas that would pass sulphur specifications. An unusual treat is employed at this plant for the treatment of separate this stock into various naphtha cuts. Upon rerunning the first two naphthas the naphtha stock before rerunning to tha cuts, rubber solvent and V.M.&P. come off sweet to doctor test, and the Stoddard solvent cut is slightly sour. To treat this cut a special oxidizing treating reagent is used. This method enables us to stay well below the sulphur limits on various cuts of naphthas, and to meet the A.S.T.M. distillation flask corrosion test.

It might be well to give the reader at this junction an idea as to the sulphur compounds found in the gasoline cut from Muskegon and Mount Pleasant crudes. In Muskegon crude gasoline the total sulphur is around .095 per cent. Of this amount about 20 per cent is hydrogen sulphur, and over 50 per cent mercaptans that are noncorrosive, no disulphides are present, and but a trace of free sulphur was found. Mount Pleasant gasoline cut



Curve 6.—Viscosity-yield relationship of bottoms from Muskegon and Mount Pleasant crudes

suitable for naphtha stock, and having around a 420 endpoint has a total sulphur of .025 per cent, and about 10 per cent of this amount is hydrogen sulphide, and the balance noncorrosive mercaptans.

In conclusion the author wishes to state that Michigan oils are not as bad as they are pictured. We have marketable outlets for the products produced in this plant. Our naphthas are known for their superior quality, and our kerosene and distillate are on a par with these same products from Pennsylvania crude. Our 350 gasoline in spite of a ping gives excellent starting in cold weather and substantial mileage. In the summer time it is adjusted so that there will be no trouble from vapor lock.

Substitution of Inferior Lubricating Oils in New York May Be Exaggerated

NEW YORK, Mar. 26.—Representatives of many large and small oil distributing companies in this city are inclined to believe that the recent survey made by the American Automobile Association does not accurately reflect actual conditions in regard to the substitution of inferior motor oils for branded motor oils and short measurements in the sale of the oils.

The survey, the results of which were released here by the New York Automobile Club and caused wide comment, is said to have been based on purchases of advertised brands of motor oils at 100 filling stations located in Greater New York. While oil companies have recognized that the substitution evil exists many have taken such precautions to guard their retail distribution that they now feel little if any substitution prevails so far as their products are concerned. The charges in regard to short measurements are not credited because measurements are often checked by state inspection officials and also by the companies themselves.

According to the survey, in 63 per cent of the cases, oil of a different viscosity or thickness from that requested by the purchaser was substituted. In 36 per cent there was short measurement ranging from 3 to 15 per cent, while there was some degree of shortage in 79 per cent of all the purchases. In only 16 per cent of the cases did the purchaser get more than he paid for, the excess in these cases being small. Comparing the oils purchased with the minimum specifications of the U. S. Government in several particulars, the contest board found that on the average 40 per cent of the oils failed to merit a quality rating above these minimums.

Variation found as between the purchases of the same brand of oil indicated that dilution is practiced to such an extent that motorists are constantly getting brands of an oil grade inferior to the grade advertised and for which they are paying. Particular importance attaches to this substitution because the manufacturers of automobiles tend more and more to recommend the use of a specific grade of oil in order to secure the most efficient operation, the maximum mileage and the minimum wear and tear on vital parts of the automobile.

Consumption of Gasoline in Canada Falls in 1933

OTTAWA, Canada, Mar. 26.—Gasoline consumption in Canada in 1933 was below that of 1932 in all provinces, according to figures released by the Dominion Bureau of Statistics. The total consumption in 1933 was 485,550,000 gallons, compared with 503,781,000 gallons in 1932, a falling off of 18,231,000 gallons. The figures in gallons for the various provinces follow:

	1933	1932
Prince Edw. Island	2,512,000	2,692,000
Nova Scotia	18,707,000	19,021,000
New Brunswick	12,520,000	13,672,000
Quebec	87,078,000	91,128,000
Ontario	229,615,000	236,689,000
Manitoba	24,319,000	26,185,000
Saskatchewan	31,795,000	33,636,000
Alberta	40,300,000	41,300,000
British Columbia	38,704,000	39,458,000
Total	485,550,000	503,781,000

Natural casinghead gasoline imports in December, 1933, were recorded at 771,648 gallons worth $400,786. The November imports were 24.1 per cent lower at 3,620,125 gallons with a valuation of $270,237. December imports of gasoline lighter than .8235 specific gravity reached a total of 795,244 gallons appraised at $82,938, compared with 760,305 gallons at $85,231 in November.

Proof of Skelly Leadership in Refining

Air View of the Skelly Refinery at El Dorado, Kansas

SKELLY was the FIRST Refiner to

1. Offer a "Better than New Navy Gasoline" when "New Navy" was the accepted standard for motor fuel.
2. Seal and tag its drums of motor oil with a tag bearing guaranteed specifications.
3. Manufacture and market a satisfactory all-petroleum, gum-free, high anti-knock gasoline.
4. Originate orange color in regular "house brand" gasoline.
5. Offer its premium grade motor fuel at the price of regular.
6. Road test gasoline from the standpoint of the consumer and the first to advertise that fact.
7. Manufacture and advertise the combination of high test and high anti-knock in one gasoline.
8. Tailor-make gasoline and motor oil to fit varying weather and geographic conditions.
9. Road test all 53 gasolines sold in the middle west and advertise the facts revealed.
10. Make a money-back guarantee on quick starting in gasoline.
11. Make a money-back guarantee on easy starting and perfect lubrication in motor oil.
12. AND NOW, Skelly has just announced a money-back guarantee on gasoline mileage, and new AIR-MIX tailor-making, to keep the air and gasoline carburetor mixture at 7600 to 1 the year around without carburetor adjustment.

SKELLY OIL COMPANY

TULSA
OMAHA
CHICAGO
KANSAS CITY
MINNEAPOLIS
DES MOINES

Pennzoil Uses Miniature Equipment in Operations

(Continued from Page 75)

is the only temperature at which the cut point of a true boiling point column will coincide with an Engler endpoint. This has been pointed out as being a limitation of the Engler distillation by A. G. Good, (Refiner & Natural Gasoline Manufacturers, Volume 12, No. 2). Distillation is continued until a vapor temperature of 450° F. is reached. At this point, the heaters are turned off. The fraction collected, boiling between 380° F. and 450° F., will have an Engler endpoint of 437° F. This may be added to the gasoline fraction if the percentage of Navy Specification gasoline is required, or may be reported as naphtha, or may be included with the kerosene fractions. When the flask has cooled sufficiently, the vacuum pump is started and a pressure of 10 mm. hg. is placed on the system. Heating is resumed and the air reflux temperatures are regulated as before. A distillation rate of 10 cc. per minute is maintained. From this point on temperatures and pressures are recorded every 50 cc. of overhead product and cuts are made every 100 cc. Distillation proceeds in this manner until the liquid in the flask reaches a temperature of 600° F., at which time, heating is discontinued for a short period of time and the pressure lowered to 5 mm. hg. When the liquid reaches 625° F., the pressure is lowered to 1 mm. hg. When the liquid temperature reaches 650° F., the distillation is finished, higher temperatures causing cracking. However, this temperature is sufficient to give vapor temperatures of over 1,000° F. when converted to atmospheric pressures.

The column is allowed to cool and drain. The residuum remaining in the flask is drawn out into a suction flask. Considerable product remains entrapped by the packing in the column and is removed by refluxing the column with benzol or petroleum ether. The diluent is then evaporated and the recovered material counted as the last overhead cut.

Each cut is corrected for volume to 60° F. and temperatures are corrected to 760 mm. hg. pressure by a temperature pressure chart. Distillation range, curve No. 1, Figure 2, is then plotted on coordinate paper.

Viscosity determinations are made on each of the overhead fractions within the viscous range of the Saybolt viscosimeter. These values are then plotted against the mid-per cent of the volume range which the fraction represents Curve No. 2. A similar curve of gravity of fractions is plotted against mid-per cent, Curve No. 4. Other tests, such as flash, fire, viscosity index, and pour, may be made on each overhead fraction or any combination of fractions. Complete physical tests are made on the residuum. Overhead fractions are then blended back with the residual oil for any type of residuum desired. The usual is a viscosity blend back curve, Curve No. 3. A flash vaporization curve may be constructed from the distillation curve by the method of Piroomov & Beiswenger (A.P.I. Proceedings 1929), Curve No. 5.

Bradford Crude Analysis

Figure 2 represents a Standard Column analysis of Bradford crude. The method of interpreting the curves are as follows: Take from Curve No. 4 the percentage of residual stock of the viscosity desired. Example, 150 viscosity at 210° F. = 19.25 per cent. Take from Curve No. 2 the mid-per cent of the wax distillate of the viscosity desired. Example, 70 viscosity at 100° F. = 70 per cent. Subtract percentage of residual stock from 100. 100—19.25=80.75. Subtract mid-percentage of wax stock from this value. 80.75—70=10.75. The resultant is then one-half of the per cent of wax stock available. 2×10.75=21.50. Take from Curve No. 1 the percentage of gasoline of the endpoint desired. Example, 380 endpoint = 37.0. In this particular analysis, all the cut boiling between gasoline and gas oil was counted as kerosene. The fraction boiling above 380° F. was blended with succeeding fractions for 45° Be. gravity. A value of 16.88 per cent was obtained. All of the above percentages are added together, the resultant subtracted from 100 and the value obtained reported as gas oil. These oils are as follows:

Gasoline, 380 endpoint	37
Kerosene, 45 Be.	16.88
Gas oil	5.37
Wax distillate, 70 vis. at 100°	21.50
600 S.R., 150 vis. at 210°	19.25

It is easy to see how this information is of value in the design of equipment. However, it is equally as useful in the operation of equipment. No matter how carefully a plant is designed, if it is not operated in the proper manner, it can never give the desired results. When operators are given such information, they have a much clearer understanding of the principles of fractionation.

A Standard Column analysis requires from two to four hours for completion. With an inspection laboratory working in conjunction, all data may be obtained in one hour extra time. Consequently, when conditions of operation are changed, checks may be run with very little loss of products.

Hydrocarbon Gas Under Extreme Conditions

(Continued from Page 40)

above the critical. The methane-propane data give an opportunity to do this for methane up to pressures of about 90 atmosphrees and over a temperature range of from 20° C. to 90° C. Below 40 atmospheres the values of f_p thus calculated (Table II) average about 150 atmospheres with a maximum deviation of less than 15 per cent and show no trend with the temperature. This value checks remarkably closely to values calculated from the solubilities of methane in pentane, etc., measured by Frolich[4] [5]. At higher pressures these data show a progressive decrease of the calculated values of f_p as the total pressure increases. Furthermore, the decrease is greater the higher the temperature. Thus at 60 atmospheres the value of f_p at 20° C. is approximately 133 whereas at 80° C. it has dropped to 87. It will be noted that this involves a decided decrease with the temperature of the value of f_p, calculated at constant total pressure. The trend with pressure here observed is exactly the opposite of that indicated by the data on solutions of methane in pentane, butane, etc. One must conclude that this method of estimating the solubility in liquids of pure components above their own critical temperature is an approximation, which, while apparently good at moderate pressures and temperatures not too far above the critical, becomes increasingly uncertain as pressures and temperatures rise. Data are at present too limited to draw any more definite general conclusions.

Nomenclature

P —vapor pressure of a pure substance
π —total pressure
T —temperature, degrees absolute
P_R—reduced vapor pressure P/P_C
π_R—reduced total pressure π/P_C
T_R—reduced temperature T/T_C
f_p —fugacity of a pure liquid corresponding to total pressure P and temperature T
f_π —fugacity of pure vapor corresponding to total pressure and temperature T
x —mol fraction of substance in the liquid
y —mol fraction of substance in the vapor

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TABLE 1

Propane in Methane

T_C=369.9° K., P_C=42 atm.

20° C: T_R=0.792, P=8.6 atm., π_R=0.205, f_p/P=0.835, f_p=7.18

π	π_r	y	x	f_π/π	f_π	f_p/f_π	y/x	Error %
10	0.238	0.868	0.992	0.817	8.17	0.880	0.875	+ 0.6
20	0.476	0.495	0.938	0.667	13.33	0.539	0.528	+ 2.2
30	0.715	0.381	0.884	0.540	16.20	0.443	0.431	+ 2.8
40	0.952	0.319	0.824	0.433	17.32	0.414	0.387	+ 7.0
50	1.19	0.286	0.764	0.345	17.25	0.416	0.374	+11.2
60	1.428	0.272	0.702	0.270	16.2	0.443	0.388	+14.2
70	1.668	0.264	0.637	0.215	15.05	0.477	0.415	+14.9
80	1.908	0.266	0.564	0.165	13.2	0.544	0.472	+15.2
90	2.025	0.286	0.476	0.145	13.05	0.550	0.600	— 8.3
95	2.265	0.310	0.417	0.105	9.98	0.720	0.793	— 7.8

40° C: T_R=0.846, P=14.3 atm., P_R=0.334, f_p/P=0.78, f_p=11.17

20	0.476	0.827	0.965	0.711	14.22	0.785	0.754	+ 4.1
30	0.715	0.549	0.908	0.587	17.61	0.634	0.605	+ 4.8
40	0.952	0.458	0.851	0.476	19.04	0.587	0.538	+ 9.1
50	1.19	0.408	0.792	0.387	19.35	0.577	0.515	+12.0
60	1.428	0.385	0.734	0.313	18.78	0.595	0.524	+13.5
70	1.668	0.378	0.671	0.255	17.85	0.625	0.563	+10.0
80	1.908	0.379	0.605	0.203	16.25	0.686	0.623	+10.1
90	2.145	0.407	0.494	0.163	14.69	0.760	0.825	— 7.9

55° C: T_R=0.887, P=20 atm., P_R=0.476, f_p/P=0.735, f_p=14.7

20	0.476	0.963	0.995	0.755	15.10	0.973	0.968	+ 0.52
30	0.715	0.703	0.945	0.632	18.96	0.775	0.750	+ 3.3
40	0.952	0.599	0.892	0.525	21.00	0.700	0.671	+ 4.5
50	1.19	0.530	0.833	0.437	21.85	0.672	0.636	+ 5.7
60	1.428	0.489	0.772	0.363	21.78	0.675	0.634	+ 6.44
70	1.668	0.476	0.708	0.296	20.61	0.711	0.673	+ 5.65
80	1.906	0.499	0.625	0.240	19.20	0.765	0.799	— 4.3

70° C: T_R=0.927, P=27.5 atm., P_R=0.655, f_p/P=0.692, f_p=19.04

30	0.715	0.897	0.979	0.665	19.95	0.956	0.917	+ 4.1
40	0.952	0.748	0.926	0.555	22.20	0.842	0.807	+ 4.3
50	1.19	0.664	0.870	0.475	23.75	0.802	0.764	+ 5.0
60	1.428	0.612	0.801	0.405	24.30	0.784	0.765	+ 2.5

80° C: T_R=0.955, P=33.0 atm., P_R=0.785, f_p/P=0.670, f_p=22.1

40	0.952	0.851	0.954	0.605	24.20	0.913	0.892	+ 2.6
50	1.19	0.757	0.894	0.518	25.90	0.854	0.847	+ 0.8
60	1.43	0.727	0.817	0.444	26.64	0.830	0.890	— 6.7

90° C: T_R=0.981, P=39.3 atm., P_R=0.936, f_p/P=0.640, f_p=25.15

40	0.952	0.956	0.990	0.635	25.40	0.990	0.966	+ 2.5
50	1.19	0.848	0.931	0.548	27.40	0.918	0.911	+ 0.8

Hexane in Butane

T_C=508° K., P_C=25.9 atm.

133° C: T_R=0.80, P=5.1 atm., P_R=0.1706, f_p/P=0.87, f_p=4.44

π	π_r	y	x	f_π/π	f_π	f_p/f_π	y/x	Error %
11.97	0.4	0.320	0.635	0.715	8.55	0.519	0.504	+ 3.0
14.94	0.5	0.219	0.478	0.656	9.80	0.453	0.458	— 1.1
17.94	0.6	0.140	0.335	0.603	10.80	0.420	0.418	+ 0.5
20.9	0.7	0.089	0.226	0.551	11.51	0.394	0.391	+ 0.8
23.9	0.8	0.048	0.114	0.502	12.00	0.378	0.421	—10.0

158° C: T_R=0.85, P= 8.5 atm., P_R=0.2842, f_p/P=0.835, f_p=7.10

11.97	0.4	0.650	0.870	0.753	9.00	0.789	0.747	+ 5.6
14.94	0.5	0.500	0.750	0.697	10.42	0.681	0.667	+ 2.1
17.94	0.6	0.330	0.624	0.645	11.57	0.614	0.609	+ 0.8
20.9	0.7	0.209	0.512	0.595	12.43	0.571	0.584	— 2.2
23.9	0.8	0.231	0.404	0.542	12.95	0.548	0.572	— 4.0
26.9	0.9	0.180	0.314	0.503	13.52	0.525	0.573	— 8.4
29.9	1.0	0.132	0.226	0.462	13.82	0.514	0.584	—12.0

183° C: T_R=0.90, P = 13.4 atm., P_R=0.4478, f_p/P=0.765, f_p=10.25

14.94	0.5	0.892	0.958	0.741	11.08	0.925	0.932	— 0.8
17.94	0.6	0.722	0.863	0.691	12.40	0.826	0.838	— 1.4
20.9	0.7	0.601	0.772	0.643	13.42	0.764	0.778	— 1.8
23.9	0.8	0.500	0.681	0.597	14.28	0.718	0.734	— 2.2
26.9	0.9	0.423	0.590	0.553	14.87	0.690	0.716	— 3.6
29.9	1.0	0.356	0.501	0.512	15.31	0.669	0.711	— 5.9
35.9	1.2	0.278	0.351	0.439	15.76	0.651	0.792	—17.8

208° C: T_R=0.95, P=19.7 atm., P_R=0.6585, f_p/P=0.717, f_p=14.12

20.9	0.7	0.962	0.982	0.697	14.57	0.970	0.979	— 0.9
23.9	0.8	0.843	0.912	0.656	15.68	0.901	0.924	— 2.5
26.9	0.9	0.742	0.842	0.617	16.60	0.851	0.880	— 3.3
29.9	1.0	0.658	0.770	0.578	17.27	0.818	0.867	— 5.7

Octane in Hexane

T_C=567° K., P_C=24.7 atm.

182° C: T_R=0.80, P=3.83 atm., P_R=0.155, f_p/P=0.882, f_p=3.38

π	π_r	y	x	f_π/π	f_π	f_p/f_π	y/x	Error %
9.89	0.4	0.155	0.322	0.715	7.07	0.478	0.481	— 0.2
12.35	0.5	0.036	0.100	0.655	8.08	0.419	0.360	+16.4

211° C: T_R=0.85, P=6.7 atm., P_R=0.271, f_p/P=0.826, f_p=5.54

9.89	0.4	0.550	0.717	0.753	7.44	0.745	0.766	— 2.7
12.35	0.5	0.360	0.550	0.697	8.61	0.643	0.655	— 1.8
14.82	0.6	0.230	0.380	0.645	9.56	0.579	0.605	— 4.3
17.30	0.7	0.120	0.220	0.595	10.30	0.538	0.545	— 1.3
19.77	0.8	0.053	0.094	0.548	10.84	0.511	0.563	— 9.2

238° C: T_R=0.90, P=10.5 atm., P_R=0.425, f_p/P=0.777, f_p=8.15

12.35	0.5	0.802	0.883	0.741	9.15	0.891	0.909	— 2.0
14.82	0.6	0.607	0.731	0.691	10.24	0.795	0.830	— 4.2
17.30	0.7	0.453	0.597	0.643	11.13	0.732	0.758	— 3.4
19.77	0.8	0.351	0.483	0.597	11.82	0.690	0.728	— 5.2
22.2	0.9	0.252	0.357	0.554	12.30	0.663	0.706	— 6.1
24.7	1.0	0.191	0.248	0.513	12.67	0.644	0.769	—16.3
27.3	1.1	0.117	0.149	0.475	12.93	0.631	0.785	—19.6

267° C: T_R=0.95, P=16.3 atm., P_R=0.660, f_p/P=0.716, f_p=11.67

17.30	0.7	0.918	0.947	0.696	12.05	0.968	0.970	— 0.2
19.77	0.8	0.742	0.842	0.657	13.00	0.897	0.882	+ 1.7
22.2	0.9	0.659	0.736	0.617	12.71	0.850	0.897	— 5.3
24.7	1.0	0.540	0.647	0.579	14.30	0.816	0.834	— 2.2
27.3	1.1	0.469	0.538	0.540	14.69	0.794	0.871	— 2.6

281° C: T_R=0.975, P=19.8 atm., P_R=0.800, f_p/P=0.686, f_p=13.58

19.77	0.8	0.910	0.970	0.687	13.60	0.998	0.910	— 0.1
22.2	0.9	0.879	0.910	0.650	14.43	0.940	0.966	— 2.7
24.7	1.0	0.738	0.823	0.615	15.20	0.893	0.896	— 0.3

Heptane in Pentane

T_C=540° K., P_C=26.9 atm.

188° C: T_R=0.85, P=7.5 atm., P_R=0.279, f_p/P=0.882, f_p=6.16

π	π_r	y	x	f_π/π	f_π	f_p/f_π	y/x	Error %
13.45	0.5	0.432	0.660	0.697	9.38	0.658	0.655	+ 0.5
16.15	0.6	0.300	0.496	0.645	10.41	0.592	0.605	— 2.1
18.8	0.7	0.200	0.360	0.595	11.20	0.550	0.561	— 1.0
21.5	0.8	0.120	0.242	0.548	11.77	0.524	0.494	+ 6.0
24.2	0.9	0.069	0.137	0.503	12.18	0.506	0.504	+ 0.4
26.9	1.0	0.014	0.029	0.462	12.43	0.495	0.483	+ 2.5

213° C: T_R=0.90, P=12.0 atm., P_R=0.446, f_p/P=0.767, f_p=9.20

13.45	0.5	0.856	0.937	0.741	9.96	0.924	0.914	+ 1.1
16.15	0.6	0.672	0.818	0.691	11.16	0.825	0.822	+ 0.4
18.8	0.7	0.540	0.700	0.643	12.09	0.761	0.772	— 1.4
21.5	0.8	0.442	0.600	0.592	12.72	0.723	0.737	— 1.9
24.2	0.9	0.357	0.500	0.553	13.33	0.688	0.714	— 3.7
26.9	1.0	0.289	0.400	0.513	13.79	0.667	0.723	— 7.8
29.6	1.1	0.229	0.316	0.474	13.74	0.669	0.725	— 7.7

240° C: T_R=0.95, P=18.0 atm., P_R=0.670, f_p/P=0.711, f_p=12.8

18.8	0.7	0.957	0.980	0.693	13.03	0.981	0.976	+ 0.5
21.5	0.8	0.816	0.883	0.657	14.12	0.906	0.925	— 2.0
24.2	0.9	0.705	0.802	0.617	14.92	0.857	0.879	— 2.5
26.9	1.0	0.624	0.705	0.578	15.53	0.824	0.885	— 4.9
29.6	1.1	0.560	0.630	0.540	16.00	0.800	0.889	—10.0

Pennsylvania Refineries Made Major Improvements

(Continued from Page 49)

Not only are all the plants operating under precise laboratory control through the installation of modern equipment, but there has been, particularly during the past year, a progressive improvement in the selection and preparation of the technical personnel.

More or less research is being carried on in every laboratory and, in some of the larger plants, very substantial appropriations have been made to carry on specific investigations looking toward the consistent improvement of its marketable products.

The entry of solvent processes into the motor oil field has been watched with keen interest by Pennsylvania region refiners. Perhaps it might be said that they have adopted a policy of watchful waiting. Whether these new methods will ever become common practice in this area is a debatable question. The reasons for this attitude should be interesting to the industry generally.

The Pennsylvania refiner takes the position that he has always made the best motor oil on the market. The processes which have been so widely publicized in the past year have had as their objective, as he sees it, the emulation or duplication of a product which already exists, and which he now markets as his premium product. Up to this time it appears that the results obtained have merely approached the physical specifications of Pennsylvania motor oil. Nothing actually new has been produced.

On the other hand the Pennsylvania interests, through the Pennsylvania Grade Crude Oil Association, has made substantial investment in a research program which has an entirely different purpose. Realizing that Pennsylvania crude possesses characteristics which have yielded the most efficient and economical lubricants in the past, it is natural to suppose that, when more is known about the complex characteristics of petroleum, it will be possible to produce an entirely new lubricant with premium qualities as far in advance of the present Pennsylvania oils as those oils now surpass the standard products from other fields.

Therefore, at the Petroleum Refining Laboratory at State College a program of basic research is being carried on to determine by fractional distillation and extraction precisely what materials tend to lend superiority to Pennsylvania lubs. The results already attained are so encouraging that the directors of the association have determined to continue the investigations. They regret exceedingly that, due to governmental economies, the Bureau of Mines researches along the same lines have been discontinued. Nevertheless, Pennsylvania will carry on, convinced that by this application of scientific research there eventually will be discovered information which may lead to new and different types of products to serve the same ends. Moreover, the Pennsylvania refiner believes that when automotive designing has progressed to a point where the engines become as efficient as the oils that lubricate them, he will be able to meet every requirement.

In passing, it may be said that a substantial number of patent applications already have been filed. When issued these patents will become the possession of the Pennsylvania Petroleum Research Corp., which is subsidiary of the Pennsylvania Grade Crude Oil Association. This corporation, which is a nonprofit organization, will be in a position to license its rights to the Pennsylvania refiners on an advantageous basis. The income from its license fees will be turned back into the research program at the college.

It will be seen, therefore, that if and when it is necessary to improve the present standards of the premium oils from Pennsylvania, the Pennsylvania refiner will be in a position to produce them and is quite as likely to present a product developed in his own laboratories as he is to adopt one of the commercial processes which were originally designed to improve the physical specifications of oils made from other crudes than his own.

Tanker Fuel Oil Prices Are Increased in East

(Continued from Page 25)

ent. Before the import tax became effective local refiners and jobbers supplemented their supplies with purchases from South American and West Indian refineries. This applied not only to the bunker grade oils but the distillates used for furnace oils. With a tax of 21 cents per barrel relatively little of these oils are now imported for domestic distribution.

Last year the surplus of the heavier oils at the Gulf Coast relieved this situation and large quantities were brought around to the East Coast. Over the past few months supplies there have gradually become more and more limited. One large factor here last fall bought several million barrels of residual fuel from a California refiner and other shipments have been made from West Coast plants which in effect have become the backlog of the eastern markets in heavy oils.

The West Coast market has also strengthened and with higher tanker rates delivered prices have increased. At this time the bunker market at Los Angeles is 60 to 65 cents on new business and with tanker rates around 65 cents per barrel this means a delivered price of $1.25 to $1.30 per barrel at eastern terminals.

Just what the answer to this situation will be is not known at this time. It is probable that in consumer contracts the sellers will insist on more flexible agreements which will protect them next season should conditions restrict the quantity of material available and refinery prices mount. Refiners realize that this market is competitive with coal, gas and other fuels and too high prices will reduce consumption and there is no disposition to advance prices to any higher levels than are justified by changed conditions in the industry. In the bunker fuel end, present quotations are now higher than foreign quotations at several points and this condition tends to shift bunkering operations away from the United States.

Prices

Prices on the tank car fuels range from 4 cents per gallon for the No. 6 grade to 5½ to 6 cents for the No. 1 grade. One large distributor which had been delivering No. 5 oil in Greater New York for 4½ cents per gallon advanced its price to 5 cents last week. The price range on gas oil suitable for cracking and gas plant is 4 to 4½ cents.

Kerosene prices are unchanged at 5¾ to 6 cents with the demand less active. Supplies of kerosene at local refineries are substantially greater than they were a year ago.

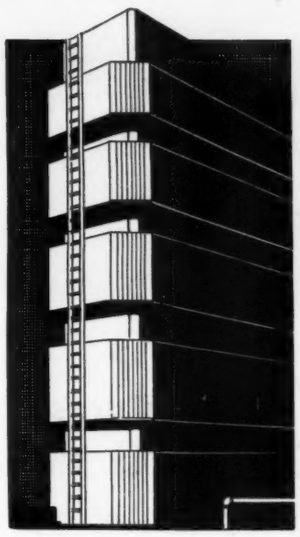
Gasoline tank car prices are unchanged from last week as posted by the larger refiners. It is reported that large jobbers in this territory are buying East Texas gasoline at a price of 3 cents per gallon. This gasoline is around 60 octane and part of it is said to come under the middle grade classification of 60 to 65 octane. A price of 3 cents basis East Texas refineries is interpreted locally to mean a delivered price at East Coast terminals not exceeding 5 cents per gallon. The middle octane gasoline is generally quoted here at a low of 5¾ cents per gallon and 65 octane and above at 6 cents per gallon.

The major sellers of steam refined stocks and bright stocks manufactured from Pennsylvania Grade and Mid-Continent crudes are maintaining firm prices in this section despite reports that more material is available from smaller refiners with the demand less active. Petroleum wax prices for export and domestic also are unchanged.

ROOSEVELT FIRE

About $10,000 damage was suffered by the Roosevelt refinery of Mount Pleasant, Mich., last week as the result of an explosion and fire. Reconstruction was started immediately.

FLUOR



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TAYLOR FORGE

SEAMLESS STEEL FITTINGS FOR WELDING

Secondary Recovery in the Pennsylvania Fields

(Continued from Page 18)

After cores have been taken of the producing sand, laboratory tests are made to determine the porosity of the sand from which can be determined the volume of air-gas required to obtain the best recovery from the producing sand. The volume of air required varies with the porosity and therefore is a function of the pressure so that the pressure required on two sands of different porosity will vary, the denser sand requiring the greater pressure.

Four strata, A, B, C and D, are shown. Stratum A includes all subsurface down to the first producing sand. Stratum B is the first producing sand. Stratum C is any intervening formation or formations between the first and second producing sands, or it may represent a highly porous section of sand which porosity tests show it is inadvisable to repressure. In this case strata B, C and D may be considered as one sand section, stratum B being of suitable porosity for repressuring and section C being too porous which would result in the channeling of the air-gas through section C so that practically no air or gas would pass through the denser section of the sand, that is, B and D.

In either case it is advisable to pack off section C. The air-gas for the B stratum sand is forced in through a 2-inch intake line through a Johnston stuffing box casinghead and vented into stratum B by means of the 2-inch open coupling. The air is confined by full expanding tubing anchor packers, Nos. 1 and 2, to stratum B.

In order to shut off the air from section C, packers Nos. 2 and 3 are run on the same string of 2-inch tubing. This effectually seals off section C, preventing any air or gas from going into an unsuitable stratum.

Section D is the lower producing sand and receives air at a definite pressure from the 1-inch intake line which runs through the 2-inch iron flange stuffing box and down through the 2-inch tubing to a point below the air vents for the stratum B sand. There is inserted in the 2-inch tubing below these air vents a 2-inch lower working barrel coupling which provides a means of setting the 2-inch pony packer, No. 4, run on the bottom of the 1-inch line. This 2-inch pony packer seals off the air-gas from the 2-inch intake line and confines it to stratum B. The air-gas from the 1-inch line passes through the 2-inch pony packer down through the 2-inch tubing string below the full expanding tubing anchor packers Nos. 2 and 3, and is vented through the 2-inch open coupling into the lower producing sand.

The purpose of the 2-inch lower working barrel coupling is to provide a seat to set the pony packer. If this coupling were not inserted in the 2-inch tubing string it would be necessary to run a 1-inch anchor below the pony packer to the bottom of the well to provide a seat.

In the Titusville-Oil City district, it is usual to set a surface string of 6¼-inch casing. This string is approximately 250 to 350 feet deep and is set on a shoulder in the well, but no casing shoe is used at the bottom of the string. Anchor clamps are provided to hold the 1-inch air intake line in place, and also to facilitate setting the 2-inch pony packer when the weight of the 1-inch string is not sufficient to expand the rubber to make a tight seal against the inside wall of the tubing.

Metering the Air

It is usually routine practice to meter the air introduced to the oil producing sand at each well. For this purpose there is provided on the 1-inch and 2-inch air intake lines a by-pass equipped with ground joint unions so that the operator can attach an assembled orifice meter which he takes from well to well. It should be understood that the arrangement of the string of full expanding tubing anchor packers is flexible and can be placed at any depth to meet any sand condition.

In air-gas repressuring operations the most important factor is the volume of repressuring media introduced to the oil sands. As pressure gauges cost little, it is usual practice to have one of these gauges permanently installed on the intake or intakes. In some installations the by-pass arrangement is eliminated. In this case there is a 15-inch long nipple inserted in the intake line between a one-half inch valve on the stuffing box side and a graduated stop on the feeder line side. The 15-inch coupling is connected through joint unions. The testing of the well proceeds as follows: A 15-inch Meriam orifice meter unit is inserted in the intake line in the place of the 15-inch coupling. The pressure gauge indication is noted (the proper pressure for the sand was determined by porosity test) and the volume of air-gas required for the sand is read on the orifice meter and the setting of the graduated stop at the proper volume is noted. The graduated stop is thus calibrated, and further testing with the orifice meter will not be required until developments indicate that the well is not functioning satisfactorily.

Materials required to equip the air-gas injection well described in the accompanying diagram, and the present catalog price of each item, are as follows: 6¼-inch by 2-inch Johnston stuffing box casinghead complete with two cast iron plugs, price $6.89; anchor clamps 4-inch by 1-inch by 24-inch, complete with bolts, $7.97; clamp bolts 1-inch by 12-inch, complete with hexagon nuts, 85 cents; clamp bolts 1-inch by 34-inch, complete with hexagon nuts, $1.67; iron flange stuffing box, 2-inch tubing for 1-inch pipe, $1.35; 2-inch standard globe valve, renewable disc, and 1-inch standard globe valves (5), renewable disc, $14.43; 1-inch standard malleable iron tees (7), and 2-inch standard malleable iron tees (3), $1.50.

Four 1-inch half ground joint unions (female), and two 1-inch half ground unions (male), $1.12; 15-inch Meriam welded unit (orifice meter), $37.50; 1-inch pipe nipples, 3-inch length (8); 1-inch pipe nipples, 4½-inch length (5); 1-inch pipe nipples, 5½-inch length (2); 1-inch pipe nipple, 10-inch length; 1-inch pipe nipples, 15-inch length (2); 2-inch pipe nipples, 14-inch length (3), $1.80.

Five 1-inch pipe plugs, 10 cents; 6¼-inch by 2-inch full expanding tubing anchor packers with 10-inch length of rubbers (3), $48.83; 2-inch open Dresser packer coupling (4), $7; 1-inch by 2-inch pony packer, $5.50; 2-inch lower working barrel coupling, 67 cents; 2-inch tubing nipples, 6-inch length (2), 30 cents; and 2-inch tubing cap, malleable iron, 15 cents. A total of $137.63.

In addition are the following materials and the price per foot net: Two-inch tubing with coupling, $0.1733 per foot; 1-inch pipe with coupling, $0.0676 per foot, and 6¼-inch 13-pound casing, $0.5879 per foot.

Thanks are due to the Joseph Reid Gas Engine Co. for the repressuring plan diagram, and to Oil Well Supply Co. for the injection well arrangement diagram.

MISSISSIPPI P.W.A. PROJECT

WASHINGTON, D. C., Mar. 26.—The public works administration has received from the public works engineers' office in Mississippi an application from Jackson for a loan of $144,000,000 for a gas distribution system, made by the Natural Gas Service Corp. of Jackson, Miss.

It contemplated construction of 8,200 miles of pipe line for gas distribution service to 1,500,000 population in the central part of the state. It also contemplated purchase of 195,000 meters at $100 each.

Public works officials said that since the application was from a private corporation there could be no hope of immediate action on it since Secretary Ickes has announced that in view of the present depleted condition of the public works only applications from public bodies would receive immediate attention. Whether this policy would be changed if more funds are allotted for public works later has not been determined.

Gasoline Prices in Chicago Area Weak But Sentiment Seems More Hopeful

By SPECIAL CORRESPONDENT

CHICAGO, Mar. 26.—While a somewhat better feeling existed in the tank car gasoline market at the start of the week than had been noted for some time past, ruling prices were still low and were not far from the lowest levels of the decline. Some of the weakest spots, however, had been cleared up and sentiment seemed to be shaping around toward the belief that prospects were improving.

Some hundreds of tank cars of East Texas gasoline were still a force overhanging the market, but this material did not seem to be pressing so actively as earlier. More encouragement was generated from the refiners' meeting in Chicago, also from reports from the east of progress being made there in plans to control refinery operations and limit gasoline stocks.

Jobbers Unimpressed

Jobbers remained mostly on the sidelines, unwilling to take much gasoline. They are not greatly persuaded as to the outlook for higher prices, although refiners are asserting with increasing emphasis that gasoline prices must advance or crude prices must be reduced—either that, or they will shut down their plants on a large scale. In fact, quite a number of shutdowns have been reported in the last few days.

Refinery operations are becoming a subject of more and more interest to the trade here. In spite of the fact that the gallonage of representative distributors has indicated that consumption is running at a comparatively high level, still accumulations of gasoline are proving an obstacle to the market's improvement. It is difficult at this time to determine what the ultimate outcome will be.

More Price Cuts

An increasing number of tank wagon and retail price cutting is reported. The Standard Oil Co. (Indiana) territory is rapidly being riddled with reductions of 1 to 3 cents a gallon, most of which are in third-grade material. It is authoritatively reported that Standard Oil Co. (Nebraska) territory has more tank wagon and service station price cuts at present than ever before in the company's history. Major companies are meeting price cuts, they report, in the smaller towns more readily than in the larger centers, but if present conditions continue it can be only a question of time until the cuts reach virtually general status. The Chicago retail market is honeycombed with reductions and concessions on the part of various sellers.

Reports are that major companies are possible buyers of the distress gasoline in the market, but these are not verified. Natural gasoline has been offered at extremely low levels and this has not aided refinery gasolines. High gravity refinery products are in limited demand. The northern regions are still finding a fair amount of call for these products but elsewhere there is little demand for them.

Kerosene Active

While gosoline is unsettled and at low price levels, kerosene is in a strong and perhaps rising market, with the kerosene season at hand. The inquiry for this product has been brisk and there have been buyers for most of this material that came out. Stocks of this material available to the spot market are represented as being quite limited and refiners seem to be holding for higher quotations. Consensus seems to be that they may get them. Farmers are reported getting into the fields in good numbers and the use of tractors is reported comparatively large. Tractor fuel has been causing much interest for some time.

Furnace Oils

Furnace oils are at the lag-end of the season but despite this, prices seem to be holding up fairly well. Temperatures have been holding low enough to promote fair distribution of the distillates, gas oils and fuels of low cold test considering the season, and prices are unchanged to a shade lower. Kerosene is helping to hold up distillates and heavy fuels are helping to hold up the zero fuels.

Industrial fuels and gas oils are strong and scarce, and are commanding good prices where buyers can find them. The industrial consumers and refiners alike are buying them. With high crude costs these materials are attractive for cracking purposes.

Lubs have been quiet. Prices show little change.

Naphthas and solvents remain dull and following the gasoline market fairly closely. Buying in the aggregate is moderate.

Crude Oil Prices

(Continued from Page 27)

Effective September 29 in Salt Flat by Shell Petroleum Corp.

Rocky Mountain States

Iles, light (Sept. 29, 1933)	$.96
Iles, heavy (Sept. 29, 1933)	.90
Florence, Colo. (June 17, 1933)	.30
Fort Collins and Wellington, Colo. (June 17)	(See Salt Creek prices)
Big Muddy (Sept. 29, 1933)	1.01
Frannie, light (Sept. 29, 1933)	.87
Frannie, heavy (Sept. 29, 1933)	.62
Salt Creek and LaBarge (Sept. 9, 1933)	
See Stanolind Mid-Continent price schedule	
Grass Creek, light (Sept. 29, 1933)	1.18
Grass Creek, heavy (Dec. 15, 1932)	.45
Elk Basin (Sept. 29, 1933)	1.18
Rock Creek (Sept. 29, 1933)	1.02
Dutton Creek (July 8, 1933)	See Mid-Continent gravity prices
Lance Creek (Dec. 16, 1932)	.92
Poison Spider (Mar. 5, 1931)	.70
Hudson (June 2, 1931)	.65
Lander (Mar. 5, 1931)	.40
Rex Lake (Feb. 22, 1930)	1.10
Osage	1.08
Lost Soldier (Sept. 30, 1933)	.88
Hamilton Dome (Dec. 16, 1932)	.25
Torchlight (Sept. 29, 1933)	1.18
Greybull (Sept. 29, 1933)	1.18
Pondera	1.15
Sunburst (Sept. 29, 1933)	1.35
Cat Creek, Montana	1.07
Hogback (Sept. 29, 1933)	1.11
Lea County, N. Mex. (Sept. 29, 1933)	.75
Maljamar (Sept. 29, 1933)*	.70
Artesia-Jackson (Dec. 1, 1933)*	.75

Note—Salt Creek, Torchlight, Elk Basin, Grass Creek, Frannie, Greybull, Hogback and Iles by Stanolind Oil & Gas Co. Elk Basin, Grass Creek light, Big Muddy, Rock Creek and Sunburst by Ohio Oil Co. Lost Soldier posted by Producers & Refiners Corp. Artesia, Jackson and Maljamar posted by Continental Oil Co. Lea County, effective September 29, 1933, by Humble Oil & Refining Co. and other buyers; Fort Collins, Wellington, Orchard, Florence, Big Muddy, Cat Creek, Rattlesnake and Table Mesa by Continental Oil Co. Osage posted by Arro.

*Continental Oil Co.

North Louisiana and Arkansas

Smackover, Ark. (all grades)	$.70
Tullos-Urania, La. (Jan. 13, 1934)	.87
Nevada, Ark. (Sept. 29, 1933)	.60
East El Dorado (Sept. 29, 1933)	.70
Other fields	(See gravity table)

Note—Smackover: Effective September 29, 1933, Texas Co., Magnolia Petroleum Co., Standard of Louisiana, Louisiana Oil Refining Corp., Gulf Refining Co. and Phillips Petroleum Co. East El Dorado posted by Magnolia Petroleum Co. and Gulf Refining Co., Nevada by Standard Oil Co. of Louisiana. Urania posted by H. L. Hunt, Inc., and Louisiana Oil Refining Co.

Eastern States

TIDE WATER PIPE CO.
(Effective October 4, 1933)

Bradford, Pa.	$2.45
Allegany, N. Y.	2.45

SOUTH PENN OIL CO.
(Effective October 4, 1933)

Pennsylvania Grade Oil in National Transit Lines (Bradford Field)	$2.45
Pennsylvania Grade Oil in Southwest Pennsylvania Lines	2.12
Pennsylvania Grade Oil in Eureka Pipe Line lines	2.07
Pennsylvania Grade Oil in Buckeye Pipe Line lines (Jan. 29, 1934)	1.97
Corning Grade Oil in Buckeye Pipe Line Co.'s lines (Oct. 2, 1933)	1.32

PENNZOIL CO.
(Effective October 4, 1933)

Pennsylvania Grade Oil in National Transit Lines:	
Group A	$2.37
Includes Cochran, Franklin, Hamilton and Doolittle districts.	
Group B	2.36
Includes Titusville district.	
Group C	2.35
Includes Turkey and Tidioute districts.	
Group D	2.34
Includes Bear Creek and Porkey districts.	
Group E	2.33
Includes Eldeneau, Bull Creek, Rough Run, Carbon, Dipner, Bredin, McJunkin, Jameson Kennerdell, Emienton, Tiona, Lacy and Kinzua districts.	
Price depends on length of pipe line haul to plant at Oil City.	

PURE OIL CO.
(Effective October 4, 1933)

Cabin Creek, W. Va.	$2.07
Bradford Hollow, W. Va.	2.07
Kelly Creek, W. Va.	2.07

Middle Western States

OHIO OIL CO.
(Effective September 29, 1933)

Lima	$1.30
Illinois (Jan. 5, 1934)	1.12
Princeton, Ind. (Jan. 5, 1934)	1.13
Plymouth	Shut in
Western Kentucky	1.16
Midland, Mich. (Sept. 30, 1933)*	1.02
Oceana, Mich. (Oct. 5, 1933)	.90
Somerset, Ky. (Sept. 30, 1933)	1.23
Hart County, Ky. (Oct. 1, 1932)	1.18

*Posted by Pure Oil Co. Producers Pipe Line Co. pays 5 cents per barrel over Pure Oil Co.'s posted price. Somerset, Ky., crude purchased by Ashland Refining Co., Ashland, Ky., and posted price includes premium. Hart County, Kentucky, crude purchased by Stoll Refining Co. Oceana posted by Old Dutch Refining Co. and Naph-Sol Refining Co.

Canada

Ontario (September 9, 1933):	
Petrolia*	$2.10
Oil Springs	2.17
Turner Valley (Mar. 5, 1934):†	
Clear naphtha	$2.87
Discolored naphtha	2.63
Crude oil, 50 gravity	2.44
Crude oil, 45 to 49.9	2.07
Crude oil, 40 to 44.9	1.50

*Imperial Oil, Ltd. †Imperial Oil, Ltd., and Regal Oil & Refining Co.

Mexico

Panuco*	$.72

*F.o.b. ship, based on December transactions and exclusive of production and export taxes and bar dues.

California Crude Oil Prices

STANDARD OIL CO OF CALIFORNIA
(Effective September 6, 1933)

For current purchases of crude oil at the well (unless otherwise specified). (All gravities above those quoted take highest price offered in that field.)

Gravity—	Long Beach	Seal Beach, Alamitos Heights	Huntington Beach	Inglewood	Playa del Rey	Olinda, Brea Canyon	Athens-Rosecrans	Torrance	Richfield	Whittier, La Habra	Montebello	Santa Fe Springs	La Habra-Coyote	Midway-Sunset, Elk Hills, Buena Vista Hills	Lost Hills	Coalinga	Coyote
offered in that field.)																	
14-14.9	$.65	$.65	$.65	$.65	$.65	$.65	....	$.65	$.65	$.65	$.65	....	$.65	$.57	$.57	$.57	$.65
15-15.9	.65	.65	.69	.69	.66	.69	....	.66	.65	.65	.65	....	.65	....	....	....	.65
16-16.9	.66	.65	.72	.73	.69	.73	....	.69	.67	.68	.65	....	.65	....	....	....	.65
17-17.9	.69	.65	.75	.76	.72	.76	....	.72	.70	.71	.65	....	.68	....	....	....	.68
18-18.9	.72	.65	.78	.80	.76	.79	....	.75	.74	.74	.65	....	.71	.61	.61	.59	.71
19-19.9	.75	.65	.81	.83	.80	.82	....	.78	.78	.78	.65	....	.74	.64	.65	.62	.74
20-20.9	.78	.68	.83	.87	.83	.85	....	.81	.82	.81	.66	....	.78	.67	.69	.65	.78
21.21-9	.81	.72	.86	.90	.87	.88	....	.83	.85	.84	.69	$.72	.81	.70	.73	.68	.81
22-22.9	.84	.76	.89	.94	.90	.92	....	.86	.89	.87	.72	.76	.84	.73	.76	.72	.84
23-23.9	.88	.81	.92	.97	.94	.95	$.83	.89	.93	.90	.76	.79	.87	.77	.79	.75	.87
24-24.9	.91	.85	.95	1.01	.97	.98	.86	.92	.97	.93	.80	.83	.90	.81	.82	.78	.90
25-25.9	.94	.89	.98	....	1.00	1.01	.90	.95	1.00	....	.85	.87	.93	.85	.85	.81	.92
26-26.9	.97	.93	1.01	....	1 04	1.04	.94	.98	1.04	....	.99	.90	.96	.89	.88	....	.94
27-27.9	1.00	.98	1.04	....	....	1.07	.97	....	1.08	....	....	.94	.99	.93	.91	....	.99
28-28.9	1.03	1.02	1.07	....	....	1.10	1.01	....	1.11	....	....	.98	1.02	.97	.94	....	1.02
29-29.9	1.06	1.05	1.09	....	....	....	1.04	....	1.15	....	....	1.01	1.05	1.01	.97	....	1.06
30-30.9	1.09	1.10	1.12	....	....	....	1.08	....	....	....	....	1.05	1.09	1.05	1.00	....	1.09
31-31.9	....	....	....	....	....	....	1 1"	....	....	....	....	1.08	1.12	1.09	....	....	1.12
32-32.9	....	....	....	....	....	....	1.15	....	....	....	....	1.12	1.15	1.13	....	....	1.15
33-33.9	....	....	....	....	....	....	....	....	....	....	....	1.16	1.18	1.17	....	....	1.18
34-34.9	....	....	....	....	....	....	....	....	....	....	....	1.19	1.21	....	....	....	1 21
35-35.9	....	....	....	....	....	....	....	....	....	....	....	1.23	....	....	....	....	....
36-36.9	....	....	....	....	....	....	....	....	....	....	....	1.26	....	....	....	....	....
37-37.9	....	....	....	....	....	....	....	....	....	....	....	1.30	....	....	....	....	....
38-38.9	....	....	....	....	....	....	....	....	....	....	....	1.34	....	....	....	....	....

Additional Standard Oil Quotations

Elwood Terrace—F.o.b. ship, 33 degrees, $1.03; 34 degrees, $1.06; 35-35.9, $1.09; 36-36.9, $1.12; 37 degrees and over 1.15.
Newhall—14 degrees and over, 57 cents.
McKittrick and Kern River—14 degrees and over, 57 cents.
Wheeler Ridge—14 to 17.9 degrees, 57 cents; 18-18.9, 58 cents; 19-19.9, 61 cents; 20-20.9, 64 cents; 21-21.9, 67 cents; 22-22.9, 70 cents; 23-23.9, 73 cents; 24-24.9, 76 cents; 25 degrees and over, 79 cents.
Kettleman Hills—33-33.9 degrees, 93 cents; 34-34.9, 96 cents; 35-35.9, 99 cents; 36-36.9, $1.03; 37-37.9, $1.05; 38-38.9, $1.08; 39 degrees and over, $1.11.

The Texas Co. posted in Shiells Canyon, South Mountain and Santa Paula as follows: 14 to 17.9, 57 cents; 3 cents added for each degree up to and including 26-26.9 degrees at 84 cents; then 4 cents added for each degree up to and including 30 degrees and over 91. Company posts Standard Oil Co.'s Montebello prices in Montebello and North Whittier, and posts Standard Oil Co. prices in Signal Hill, Alamitos Heights, Huntington Beach, Torrance, Richfield and Santa Fe Springs, all effective September 6.

General Petroleum Co. posts Standard Oil Co. prices in Athens, Rosecrans and Signal Hill; Alamitos Heights up to 26-26.9; Santa Fe Springs up to 35-35.9; Richfield up to 25-25.9; Brea Canyon and Olinda up to 25-35.9, and Torrance up to 25-35.9.

Union Oil Co., effective September 6, posts same price as Standard Oil Co. in all fields in which both purchase, excepting that in Athens-Rosecrans, Union Oil Co. posts 21-21.9, 72 cents, and 33-33.9, $1.18; 34-34.9, $1.21, and 35-35.9, $1.24.

Associated Oil Co., effective September 6, posted same prices for the same grades as Standard Oil Co. of California, excepting that in some fields its gravity scale stops as follows: Huntington Beach, 26 degrees and over; Seal Beach and Alamitos Heights, 30 degrees and over; Coyote Hills, 23 degrees and over; Richfield, 25 degrees and over; Torrance, 25 degrees and over; Inglewood, 24 degrees and over; Santa Fe Springs, 35 degrees and over; Midway-Sunset, Elk Hills, Buena Vista Hills, 30 degrees and over. Also Associated pays 52 cents for oil of 11 to 13.9 gravity in McKittrick, Kern Front, Kern River, Midway-Sunset, Elk Hills, Buena Vista Hills and Coalinga.

Position of Rumania in the World's Oil Industry

(Continued from Page 10)

this curtailing of salaries is causing a reduction in consumption, which leads to stagnation in commerce and industry. We, the merchants and industrialists, are against this procedure, but in order to prevent it, it is necessary that the state give us its assistance, reducing the taxes which can hardly be borne, as well as the cost of transport. The cheapening of the prices of goods in this way will make it possible for the workmen and employes to cover their necessities—for the good of commerce and industry."

In this way we would also obtain an increase in the consumption of products and come back to the basic idea which we always put forward as a remedy for this crisis: The free circulation of goods in every respect. The expansion of the circulation of goods is also dependent on the improvement of the means of transport. What we, the industrialists, need, is to have easy and cheap connections between the villages and the towns, and good roads. We are convinced that those who are leading the destiny of the country today are aware of our difficulties, and we are looking forward to the announced alleviation, which will bring prosperity to the Rumanian industry.

Rumania's Oil Industry Compared With the World

Our petroleum industry began its activity in 1933 under the auspices of the international agreement concluded with the Anglo-American groups in December, 1932, and modified afterwards in the conference of March 27, 1933. Rumania has strictly kept the obligations which it entered into with regard to a collaboration for the improvement of the situation of the world industry.

Rumania was obliged to give notice of termination of this agreement, making use of its contractual rights, only after a disproportionate increase in the output of crude oil of the United States of America, which, having officially been fixed by the Washington conference in April, 1933, at about 2,000,000 bbls. per day, had increased by degrees, attaining in a short time the figure of 3,000,000 bbls. per day.

The United States of America only succeeded in stabilizing its production during the last months of the year, thanks to the drastic measures taken by the Government in instituting a dictatorship of the oil industry in that country.

Although independent in its development after the denunciation of the agreement, the economic policy followed by Rumania is evidenced by the avoidance of a too great increase in production. It is a policy of prudence, although the riches of the soil and the speedy methods of working would have permitted an increase of output.

Rumania has extracted only the quantities of crude oil necessary to the internal consumption and the holding of its markets abroad, thus avoiding the weakening influence on world prices which an excess of products destined for export would cause. In the circumstances of today, Rumania is ready to co-operate, as it has done formerly, in the improvement of world market conditions, but with the observation and preservation of its rights and its position in the world petroleum market.

HOUSTON OIL ELECTION

HOUSTON, Tex., Mar. 26. — Stockholders of the Houston Oil Co. at their annual meeting approved reports of the president, George A. Hill, Jr., and elected the following directors: Holman Cartwright, David Hannah, George A. Hill, Jr., A. H. Kennerly, George D. Sears, and A. W. Standing, all of Houston; Samuel C. Davis, S. W. Fordyce, George E. W. Luehrman, B. H. Lang, Thomas S. Maffitt and Ethan A. H. Shepley, all of St. Louis, and L. S. Zimmerman of Baltimore.

Legal Background of Nathan R. Margold

(Continued from Page 11)

of the City of New York, and New York County Lawyers Association. He was a director of the American Indian Defense Association and chairman of the Indian Civil Liberties Committee of the American Civil Liberties Union.

Retained as legal adviser in Indian affairs by the Institute for Government Research, Mr. Margold carried out the first complete study of the important and vexed subject of Indian claims against the Government. In 1930 he succeeded, as a volunteer, the late Louis Marshall as counsellor to the Pueblo Indian tribes, primarily in the matters connected with the large controversy involving the Pueblos from Isleta to Cochiti and the Middle Rio Grande Conservancy District. The settlement for which Mr. Marshall, succeeded by Mr. Margold, had contended was made effective in May, 1930, and under it the conservancy development has gone forward successfully, to the satisfaction of Indians and whites alike. The first self-liquidating enterprise to receive cash from the R.F.C. was the Middle Rio Grande Conservancy District.

Thereafter, still as a volunteer and at his own expense, Mr. Margold became associate counsel of the attorneys for the Pueblo tribes (Hanna and Wilson, of Albuquerque, and Barker and Fahy, of Santa Fe) who were handling the land title litigations and the litigations involving compensation to the tribes for lands lost pursuant to the Pueblo Lands Act of 1924.

Annual Meeting of Petroleum Geologists

(Continued from Page 13)

Baker Hotel, and the Geophysics Division in the main auditorium of the Dallas Power & Light Building. At these meetings technical papers pertaining to subjects allied with each division of the industry were presented and discussed. Elections of officers were also held.

N. L. Thomas, Pure Oil Co., Fort Worth, Tex., was elected the new president of the Society of Economic Palentologists and Mineralogists, succeeding Fred Plummer, University of Texas, Bureau of Economic Geology, Austin, Tex., who served in that capacity last year. Merle C. Israelsky, with the United Gas System, Houston, Tex., was chosen vice president; Gayle Scott, of Fort Worth, was re-elected secretary-treasurer, and Dr. Raymond C. Moore, of Lawrence, Kans., was re-elected editor.

E. E. Rosaire, president of the Independent Geophysical Co., of Houston, Tex., was elected president of the Society of Petroleum Geophysicists, succeeding Eugene McDermott, of Dallas; Frank Goldstone, Shell Petroleum Corp., Houston, Tex., vice president; Bela Hubbard, Carter Oil Co., Tulsa, secretary-treasurer; and B. B. Weatherby, Geophysical Research Corp., Tulsa, editor. The business representatives to the A.A.P.G. are O. C. Lester, vice president of Geophysical Research Corp., Tulsa, and A. Selig, of Stanolind Oil & Gas Co., Fort Worth, Tex.

At the general session in the Crystal Ballroom of the Baker Hotel, the program on Friday was made up of papers by M. G. Cheney, "Well Spacing Problem Involved in Petroleum Geology"; C. Dwight Avery and J. Charles Miller, "The Relationship of Geology to Unit Operation of Oil and Gas Fields Involving Government Lands"; and O. E. Meinzer, "Movements of Underground Water."

These papers were discussed at some length and in the afternoon session O. L. Brace presented a paper on the "Factors Governing the Estimation of Recoverable Oil Reserves in Sand Fields." Following Mr. Brace "The East Texas Field," was discussed by J. S. Hudnall, consulting geologist, Tyler, Tex. These papers created discussion that took up most of the balance of the afternoon and left the audience divided into two schools of thought so far as Mr. Hudnall's paper was concerned.

On Saturday, N. W. Bass, presented a very interesting paper on "Origin of the 'Bartlesville' Shoestring Sands of Kansas," and Parker D. Trask and H. E. Hammar presented a paper on "Preliminary Study of Source Beds in the Mesozic Rocks on the West Side of the Sacramento Valley, California."

In the Saturday afternoon session papers by Shepard W. Lowman, on "Cherokee Structural History of Oklahoma"; "A Study of Subsurface Faults in Oklahoma," by Ira M. Cram; and a symposium on recent developments in western Oklahoma into which R. W. Brauchli described the Edmond Pool, Oklahoma City, Okla., and T. M. Ragsdale, the Chandler Pool and West Extension of Lincoln County, Oklahoma, with other discussions by H. S. Thomas, on "The Lucien Pool"; G. C. Maddox, "The Crescent Pool"; Glenn Grimes, "The Tatums Pool," and E. I. Thompson, "Wildcats in Western Oklahoma."

A number of papers were presented by title only and will be later prepared and published in the A.A.P.G. Bulletin.

The social features of the meeting were the smoker and banquet and dance which were well attended. The place for next year's meeting will be decided later by the executive committee.

President Dawes Reports More Reserves by Pure

Pure Oil Co. engineers, says H. M. Dawes, president, in the annual report, believe the company entered 1934 with larger crude oil reserves in the ground than was the case a year ago, despite the fact that 22,278,400 bbls. of oil were produced during 1933. Present gross production of the company in the Van Field, East Texas, is curtailed to 26,865 bbls. daily, although engineers believe the field is capable of yielding four to six times that amount over a long period. Proration forced the company to buy 3,937,300 bbls. of oil last year at cash cost of $3,702,700, thus materially decreasing earnings, says Mr. Dawes.

"While the company is operating in 35 oil fields, it has, in recent years," says Mr. Dawes, "concentrated its development work upon large tracts, so that in two major oil fields—Van and Michigan—it owns more than half of the producing property. In the Louise Field in Wharton County, Texas, and in Gueydan in Vermillion Parish, Louisiana, it would appear at the present moment that the company had practically all of the productive territory. It is too early in their development to speculate accurately on the possibilities of these two fields, but the prospects are definitely encouraging."

Potential output of the Midland Field is estimated at about 100,000 bbls. daily, although prorated to 29,000 bbls.

The company's heavy losses in the first six months of last year were more than offset during the latter six months, says Mr. Dawes. Total sales of petroleum products were 1 per cent greater in volume than in 1932, but the amount realized was 5½ per cent less. Gasoline prices, Mr. Dawes says, are too low to be considered normal, but the trend is better, with January 1 price higher than the 1933 average.

OHIO OIL CO. REPORT

Ohio Oil Co. and subsidiaries report net loss of $130,016 for 1933 after charges, compared with net profit of $7,242,981 in 1932. The last half of the year resulted in net profit of $3,003,158. There was a loss of $3,133,174 in the half ending June 30.

For the year 1933 the company charged off for depreciation $5,398,644; for depletion, $1,332,615; for inventory losses, $280,909, and against canceled unoperated leases, $979,673, making the total of such charges $7,991,741.

In 1932 the company charged off a total of $7,238,342 against depreciation, depletion and canceled leases and nonproductive wells.

Phillips 66

World's Largest Producers of Natural High Gravity Gasoline

▲

Phillips Petroleum Co.

Bartlesville, Okla.

MARKET RECORD OF OIL SECURITIES

Active Oil Stocks Listed on New York Stock Exchange

Compiled by Carl H. Pforzheimer Co., 25 Broad Street, New York City, Members New York Stock Exchange and New York Curb Exchange

1934 High	1934 Low	Week ended March 24 Sales	High	Low	Close	Stocks—	Total shares outstanding	Par value	Dividend rate	Payable or last paid	1933 High	1933 Low	1932 High	1932 Low	1931 High	1931 Low
50⅜	41½	5,700	49¼	47½	49¼	Amerada Corp.	774,875	N.P.	50cQ	1-31-34	47⅝	18½	22¾	12	23	11¼
35¼	28¼	16,100	31	29½	30	Atlantic Refining	2,673,834	$25	25cQ	3-15-34	32½	12⅝	21⅞	8⅝	23⅝	8⅝
10	7¾	7,400	8⅜	8	8⅛	Barnsdall Corp.	2,186,385	$5	....	5-11-31	11	3	7	3⅜	14½	4
19¼	11⅛	36,900	16¼	15⅛	16¼	Columbia Gas & Elec.	11,610,036	N.P.	12½cQ†	2-15-34	28⅛	9	21	4¼	45⅝	11⅝
14¼	9¾	45,600	12½	11⅞	12½	Consolidated Oil Corp.	14,218,835	N.P.	28c	4- 7-34	15¾	5	9	4	75⅞	4⅛
20⅜	16½	42,500	19⅜	17½	19⅜	Continental Oil of Delaware	4,738,593	$5	25c	4-30-34	19⅝	4⅞	9⅜	3⅝	12	5
21¾	15½	2,600	18½	17⅛	18½	General Asphalt	387,149	$10	....	6-15-32	27	4⅝	15½	4¾	47	9⅝
5½	4⅜	2,200	4⅝	4⅜	4⅜	Houston Oil (new)	1,098,618	$25	....	10-17-30	7⅜	1⅞	5⅜	1⅛	14⅛	3
2¾	1¾	1,400	2⅛	1⅞	2	Louisiana Oil Refining	1,302,158	N.P.	....	.....	4	⅝	2¼	½	4½	1
14¾	11⅝	5,700	12¾	12	12½	Mid-Continent Petroleum	1,857,912	N.P.	....	2-16-31	16	3¾	8⅞	3¾	16¾	5
18¾	11½	1,400	15½	14⅞	15	National Supply of Delaware	382,591	$25	....	5-15-31	28⅝	4	13	3½	70¼	5
15⅞	12⅝	25,000	13½	12⅝	13¼	Ohio Oil Co.	6,563,107	N.P.	....	12-15-32	17⅝	4¾	11	5	19½	5⅛
8¼	6½	700	7	6½	7	Pacific Western Oil	1,000,000	N.P.	25c‡	10-25-33	9½	3	8	3	15	2⅞
2⅜	1¼	1,300	1⅞	1¾	1¾	Panhandle P. & R.	198,770	N.P.	....	.....	4¼	⅜	1¼	¼	4¼	⅝
18¾	15⅛	43,600	18⅜	17	18¼	Phillips Petroleum	4,155,113	N.P.	25c	2-15-34	18¾	4¾	8⅛	2	16⅝	4
16¾	12⅝	6,700	14¾	14¼	14¾	Plymouth Oil Co.	990,261	$5	25cQ	3-31-34	17⅝	6¾	12½	6	19	6
14⅞	10⅜	20,300	12⅝	11⅞	12⅝	Pure Oil	3,038,370	N.P.	....	9- 1-30	15⅜	2½	6½	2⅞	11⅞	3¼
39⅛	36	1,100	37¾	36⅛	36⅛	Royal Dutch N. Y. shares	432,224	$14	$1.07½	8-14-33	39¾	17⅝	23¾	12⅛	42⅝	13
37	25⅜	4,400	34½	32¾	34	Seaboard Oil of Delaware	1,204,460	N.P.	15cQ§	3-15-34	43⅜	15	20⅜	6⅝	20¾	5½
11⅞	7⅝	10,600	10¼	9¾	9⅞	Shell Union Oil	13,070,625	N.P.	....	6-30-30	11⅝	4	8¾	2½	10¼	2½
89	58	100	77½	77½	77½	Shell Union Oil pfd.	400,000	$100	....	7- 1-31	61	28½	65¼	18	78	15
11¼	9	600	10	9½	10	Simms Petroleum	461,000	$10	25c	1-17-34	12⅜	4⅞	7½	3¼	11	3½
11½	7⅞	3,200	10⅝	10	10¼	Skelly Oil	1,008,514	$25	....	12-15-30	9⅞	3	5¾	2½	12⅞	2
19⅞	15⅛	48,600	16¾	15⅝	16¾	Socony-Vacuum	31,019,694	$25	15c	3-15-34	17	6	12¼	5¼	21	8⅜
42⅞	37¼	16,300	37⅝	35¾	36¾	Standard Oil of California	13,102,900	N.P.	25c	3-15-34	45	19½	31⅞	15⅛	51⅜	23⅛
38	33⅞	No sales	..	..	..	Standard Oil of Kansas	200,000	$10	50cQ	4-30-34	39⅞	12¾	16½	7	19	7¾
50⅛	44¼	34,200	45⅜	44⅛	45¼	Standard Oil of New Jersey	25,740,065	$25	50cSA	12-15-33	47½	22¾	37⅜	19⅞	52½	26
61½	51½	600	60⅛	58	60⅛	Sun Oil	1,591,110	N.P.	25cQ	3-15-34	59	35	39⅞	24⅜	45¼	26¾
29⅜	23½	17,900	26¼	25⅛	26	Texas Corp.	9,486,417	$25	25cQ	4- 1-34	30⅛	10¾	18¼	9¼	36¼	9⅞
4½	3⅛	2,200	4	3¾	4	Texas Pacific Coal & Oil	880,703	$10	....	12-31-29	6½	1⅜	4	1½	6½	1⅞
11⅜	8½	22,300	11½	11	11¼	Tide Water Associated	5,613,800	N.P.	....	2-16-31	11⅜	3⅛	5⅝	2	9	2⅛
77½	64½	600	77½	75¼	77½	Tide Water Associated pfd.	666,524	$100	$1.50Q	12-23-33	65¼	23½	60	20	68	20½
20½	15⅛	8,800	17⅛	15⅛	17⅛	Union Oil of California	4,386,070	$25	25cQ	2-10-34	23⅜	8½	15⅜	8	26⅝	11
21	15⅝	1,300	18½	17½	18½	Union Tank Car	1,200,000	N.P.	30cQ	3- 1-34	22¾	10½	19¼	11¾	25⅛	16
5⅝	3⅝	2,700	5	4¾	4⅞	Wilcox Oil & Gas	424,839	$5	....	5-10-28	5½	2	8¾	2¾	9⅜	2⅝

*Ex-dividend. †Payable in 5 per cent convertible preferred stock. ‡Initial dividend. §Plus extras.

Active Oil Stocks Listed on New York Curb

Compiled by Carl H. Pforzheimer Co., 25 Broad Street, New York City, Members New York Stock Exchange and New York Curb Exchange

1934 High	1934 Low	Week ended March 24 Sales	High	Low	Close	Stocks—	Total shares outstanding	Par value	Dividend rate	Payable or last paid	1933 High	1933 Low	1932 High	1932 Low	1931 High	1931 Low
38	32	150	36	35½	35½	Buckeye Pipe Line Co.	200,000	$50	75cQ	3-15-34	39¾	25	35	17½	56	30
5¼	2¾	37,900	5¼	3⅝	5⅛	Carib Syndicate	579,000	25c	....	.....	7¾	¼	¾	¼	2⅜	1⅛
126½	118½	No sales	..	..	..	Chesebrough Mfg. Co.	120,000	$25	$1Q†	3-30-34	129	71	90	53	129½	75
4¼	1¾	28,400	3	2⅞	3	Cities Service	37,804,394	N.P.	....	6- 1-32	6¼	1½	6⅞	1¼	20¾	5
3¼	2½	3,600	3	2½	3	Colon Oil	2,200,000	N.P.	....	.....	4	⅛	1¼	¼	3⅛	⅛
3⅞	1⅝	700	3¼	2⅞	3¼	Cosden Oil	399,687	$1	....	.....	3⅞	1⅜	2⅞	¼	3¾	⅜
13	9⅝	24,400	11⅞	10⅞	11½	Creole Petroleum	6,974,356	$5	....	.....	12	4¾	3⅛	1¾	3⅞	1⅝
7½	4¾	700	6⅝	6½	6½	Darby Petroleum	509,696	$5	25c	2-15-34	8	2⅛	7⅛	1⅝	2½	1⅝
2¼	1⅝	300	1⅞	1⅞	1⅞	Derby Oil & Refining	263,162	N.P.	....	.....	2¾	⅞	3	1	6	1½
35¾	31	No sales	..	..	..	Eureka Pipe Line	50,000	$100	$1Q	2- 1-34	41¾	20	35	18	36	19
76¾	58½	11,700	68¾	63½	68	Gulf Oil Corp.	4,538,101	$25	....	10- 1-31	62	24	44¾	23	75½	25⅜
43½	33½	10,700	43¼	40¼	42¾	Humble Oil & Refining (new)	8,923,935	N.P.	25cQ	4- 1-34	105½	40	55	35⅝	72	44½
14½	12⅝	3,500	14	13½	13¾	Imperial Oil of Canada	26,742,792	N.P.	12½c‡	3- 1-34	15⅞	6½	10⅞	6¼	18¼	7⅜
6⅞	3⅞	500	4⅛	3⅞	4⅛	Indiana Pipe Line	300,000	$10	15cSA	5-15-34	8	3¼	7½	2¾	21⅛	5½
23¾	19⅜	10,100	23⅛	21¾	22¾	International Petroleum	14,247,088	N.P.	28cQ†	3-15-34	23½	8⅞	12¼	8	15½	7⅜
3⅛	2⅛	1,000	2¾	2⅝	2¾	Louisiana Land & Exp.	3,000,000	N.P.	....	.....	2¼	⅛	2½	½	2	½
5⅞	4	200	4	4	4	Lion Oil Refining	270,000	N.P.	....	10-27-30	9½	1¼	3½	⅞	6¾	1½
8¾	5¾	200	6¾	6¾	6¾	Lone Star Gas	5,382,723	N.P.	16cQ§	3-31-34	11⅞	4¾	11	3⅜	29	5½
5¾	4	700	4¾	4½	4¾	Mountain Producers	1,682,182	$10	15cQ	4- 2-34	6½	2½	4¾	2⅛	5⅞	2
15¼	14	2,600	14½	14⅛	14½	National Fuel Gas	3,810,183	N.P.	25cQ	4-16-34	20	10	14⅝	8	26½	9¾
9½	8	500	9¼	9	9¼	National Transit	509,000	$12.50	40cSA	12-15-33	10	5½	10½	6	17½	5
2⅛	1¾	100	1¾	1¾	1¾	New Bradford Oil	1,445,202	$5	10c	3-15-34	2⅛	½	⅞	¼	1½	½
1⅜	1	700	1⅛	1⅛	1⅛	New Mexico and Arizona	1,000,000	$1	....	.....	1⅞	½	1¼	⅜	3	¾
4¾	3	100	3¾	3¾	3¾	New York Transit	100,000	$5	15cSA	4-14-34	4⅞	3	9¾	7½	14½	5⅞
7	4⅝	200	5⅝	5⅝	5⅝	Northern Pipe Line	120,000	$10	25cSA	1- 2-34	6¼	4¼	5½	3⅛	35½	20
2½	⅞	26,900	2½	1¾	2¼	Pantapec Oil	1,608,700	N.P.	....	.....	3¾	⅛	⅝	1/16	2	⅜
3⅛	1¼	5,200	3⅛	2⅝	3	Ryan Consolidated	296,931	N.P.	....	.....	4¼	⅝	2⅛	⅝	3	¾
7¼	5¾	2,000	6⅞	6½	6½	Salt Creek Producers	1,496,859	$10	20cQ	2- 1-34	9¼	3½	5½	2⅞	7⅝	2¾
23⅞	17½	1,000	21½	21	21½	South Penn Oil	1,200,000	$25	30cQ	3-31-34	22⅛	11	16½	9⅝	23⅞	9¼
4¾	4	No sales	..	..	..	Southern Pipe Line	100,000	$10	10cSA	3- 1-34	6	2⅛	10	3¾	17	7
47	41	No sales	..	..	..	Southwest Penna. Pipe Lines	35,000	$50	$1Q	4- 2-34	43	24½	37	27	42½	25
32¾	26⅛	16,200	27½	26⅛	26¾	Standard Oil of Indiana	15,941,894	$25	25cQ	3-15-34	34	17	25⅛	13⅛	38½	13½
17⅝	14⅝	2,000	16⅛	15⅝	15⅞	Standard Oil of Kentucky	2,606,983	$10	25cQ	3-15-34	19¼	8⅜	15⅞	8⅞	23⅝	12⅛
16⅝	13½	300	15¼	15	15¼	Standard Oil of Nebraska	190,822	$25	25cQ	3-20-34	20½	11	19	10¼	36½	16
27½	23¼	250	24½	23¾	24½	Standard Oil of Ohio	753,740	$25	....	1- 3-33	41	15½	30⅛	15½	62½	23
2	1/16	2,500	1⅜	1½	1⅝	Sunray Oil	1,162,840	$5	....	4-15-31	1½	¼	⅝	⅛	5¼	⅛
11	6¼	2,300	8¾	6¾	6⅞	Texon Oil & Land	936,028	N.P.	15c	3-31-34	13¾	6¼	10½	4½	12⅞	2⅛

*Ex-dividend. †Plus extras. ‡Payable in Canadian funds. §Payable in preferred stock.

Note—In comparing highs and lows for the several years in the two tables, it will be necessary to take into consideration cases where there have been stock split-ups.

Showings Southeast of Government Wells Are Attracting Attention in Southwest Texas

SAN ANTONIO, Tex., Mar. 26.—Bridwell Oil Co.'s No. 1 Southerland, 3 miles southeast of the Government Wells Field in Duval County, was attracting much interest throughout the Southwest Texas area during the past week with its encouraging shows in the Government Wells sand. This test had hard sand with a show of oil from 2,706-08 feet and soft oil sand from 2,708-14 feet. Late in the week it was waiting on cement to set after landing the 6⅝-inch casing at 2,706 feet to shut off some of the gas. Gas sand was drilled from 2,689-2,706 feet. It will probably be given a test during the first part of the week. When it first topped the Government Wells sand operators were of the opinion this test would not make an oil producer as it had topped the sand at 2,689 feet or minus 2,012 feet, which is several feet higher than Campbell's No. 1 Hoffman gas well, about a mile southwest.

San Patricio County

Interest in the Sinton area, San Patricio County, has showed no signs of abating and the active lease play is progressing at a strong pace. Plymouth Oil Co.'s No. 1 Welder, north of Sinton, one of the most watched wildcats in Southwest Texas, late in the week was coring at 5,530 feet with nothing showing. At almost any time it should pick up the sand which is producing from the 5,400-foot depth in the Refugio Field. C. B. Bunte's No. 1 J. D. Holland, 2 miles southwest of Sinton, in Section 26, of the Eaton Subdivision, was drilling below 1,776 feet. Atkins & O'Neil's No. 1 Welder, 2 miles west of Angelita, has had several encouraging gas sands and late in the week was drilling at 3,150 feet. Both of these tests are being watched with much interest.

Karnes County

In southern Karnes County, Magnolia Petroleum Co.'s No. 1 Scarborough has been shut in as a gas well which was rather disappointing as it had been considered favorable for a good producer, but it ran too high on the top of the Pettus sand which was encountered at 3,621 feet. It bottomed hole at 3,639 feet and showed 600 pounds tubing pressure and 800 pounds casing pressure with only a small spray of oil. It was allowed to blow open over night in an effort to increase the oil but it failed to have any effect.

Frio County

Amerada Petroleum Co. has staked location and is preparing to drill its third deep test on the company's fault line block of more than 85,000 acres in Frio and Zavala Counties. The test will be No. 2 Halff & Oppenheimer, 2,100 feet from north and 800 feet from east lines of the B. J. Gilman Survey No. 16, 5 miles southwest of Pearsall in Frio County. Amerada's No. 1 Diering, southwestern part of the county and about 12 miles southwest of the above location, will be completed as a gas well. It drilled to a total depth of 6,507 feet in the Edwards lime and after treating with 1,000 gallons of acid made about a half barrel of oil per hour with 15 bbls. of salt water hourly. It has been plugged back to 6,457 feet and is recementing casing. The well is good for about 4,000,000 feet of gas daily. The showing in this well has been sufficient to warrant the drilling of the third test and it is the general belief that a big field will eventually be found on this big fault line.

Bexar County

I. L. Dingman's No. 1 Coffey, 7 miles south of San Antonio, in Bexar County, which caused considerable excitement when it blew out two weeks ago after encountering gas in top of the Austin chalk, is preparing to drill deeper for the Edwards lime. It topped the Austin chalk 1,017 feet and bottomed hole at 1,034 feet. It is the general opinion that there are fairly good chances of finding Edwards lime production in this area. This test is now making about 2,000,000 feet of gas daily and spraying some mineral water.

McMullen County

Magnolia Petroleum Co.'s No. 1 Kinsaid, wildcat test just north of the Nueces River in McMullen County, was drilling below 2,519 feet and making a careful check of all formations. C. C. Shumway's No. 4 Shiner, in Section 38 of the Shumway's Subdivision, has made two drill stem tests in the Government Wells sand from 1,554-84 feet, resulting with some free oil and show of gas in both tests. If the lower formations prove nonproductive it will probably be plugged back to the Government Wells sand and given another test, as it is the understanding that the two last tests were not satisfactory.

Aransas County

In Aransas County American Liberty Oil Co. has made location for No. 1 Dietzel, a deep test to be drilled about a mile west of Rock Port, where the company has been doing some geophysical work for the past two months. The company has a block of around 5,000 acres in the area and is now moving in material for the test to be drilled in Lot 34 of Block 4.

Medina County

Humble Oil & Refining Co.'s No. 1 Dodson, near the town of Yancey, in Medina County, and Edwards lime test, had sand 1,471-82 feet showing gas. On a drill stem test of the sand it showed nothing but mud. Late in the week it was drilling ahead below 1,630 feet.

Nueces County

In Nueces County, Diadem Oil Co. has completed derrick for No. 1 J. C. Mayo, in Section 23, near Robstown. Sullivan and Texon Royalty Co.'s No. 1 Simmons & Perry, 2 miles east of the Agua Dulce Field, was drilling below 4,051 feet.

Starr County

Of interest the past week was the new producer in the wildcat territory of the Jeffries-Lambeth area of Starr County. Jeffries-Lambeth's No. 2 Starr County Land & Cattle Co., encountered sand from 2,502-15 feet and on a drill stem test showed 400 feet of oil in 12 minutes. Casing has been cemented at 2,494 feet. Before cementing casing it started flowing by heads and is estimated good for 75 to 100 bbls. daily. This test is 800 feet southeast of the company's No. 1 gasser which was completed last year. Milhoon Drilling Co.'s No. 1 Rogan, in the El Javali grant, has been abandoned with total depth of 1,622 feet. In the Cuevitas Pool, Sun Oil Co.'s No. 1-D Guerra in Share 1, Zacatosa grant, was drilling at 2,605 feet.

Goodwin & Yantis' No. 3 Kelsey-Bass, in Porciones 86 of ancient jurisdiction of Camargo was completed during the past week estimated good for 15,000,000 feet of gas with 700 pounds pressure. It is just east of No. 4 Kelsey-Bass, which was recently completed for around 6,000,000 feet of gas. Both wells are now shut in.

Jim Hogg County

In Jim Hogg County, French Oil Co.'s No. 1 Gutierrez, in Survey No. 142, east from the Alworth Pool, has been abandoned as dry with total depth of 2,503 feet. A. W. Majors' No. 1 M. Guerra & Son, near the center of Survey 839, was drilling at 2,205 feet.

Bee County

In Bee County, Phillips Petroleum Co. has spudded No. 1 Morgan, a wildcat test on its 13,930-acre tract in the Eyles Survey. Howeth & Swiger have completed derrick for No. 1 Scott in Block 30 of the Howeth & Swiger Subdivision in the Molina Survey.

Caldwell County

In Caldwell County, Whitfield and others have abandoned No. 1 Wilms. It topped the chalk at 1,118 feet and bottomed hole at 1,625 feet at which depth it was abandoned as dry. It is located on a 165-acre tract in the Cornelius Survey.

Bastrop County

Anderson's No. 1 R. M. Trigg, in the J. Stewart Survey of Bastrop County, topped Serpentine at 1,438 feet and encountered a show of oil from 1,685-1,703 feet in Serpentine. It was waiting on cement to set with total depth of 1,713 feet. Don B. Megahan's No. 1 Charles Holcomb, a wildcat in the John W. Bunton Survey, has been abandoned as dry with total depth of 2,231 feet. This well topped the Serpentine at 1,687 feet and drilled base of Serpentine at 2,067 feet.

DeWitt County

Three tests have been made in Humble Oil & Refining Co.'s No. Kuester wildcat in DeWitt County, all of which showed salt water. The last drill stem test was made from 3,870-84 feet and showed 7 thribbles of salt water. It tested salt water from 3,765-74 feet and 3,837-39 feet. Late in the week it was drilling ahead below 4,305 feet in shale. This test is in the S.A.&M.G.R.R. Survey No. 7.

Travis County

Two wells were abandoned during the past week in Travis County. Franklin and others' No. 1-A Reimers, in Survey No. 35, was abandoned as dry after reaching a depth of 933 feet, while G. M. Rowe's No. 2 Smith, on a 200-acre tract in the L. Kimbro Survey, was abandoned at 822 feet.

Williamson County

In Williamson County, Taylor Refining Co.'s No. 2 L. Bachmeyer, in the H. White Survey, 6.5 miles southeast of Taylor, has been completed for 15 bbls. of oil daily with total depth of 861 feet. Same company's No. 1 Zeischang, in the H. White Survey, was abandoned with total depth of 1,100 feet.

Zapata County

Zapata County marked up two abandonments during the past week. In the Mirando Valley Pool, O. W. Killam's No. 1 R. Hinnant, in Block 7, of Survey No. 10, was abandoned with total depth of 1,772 feet. Danvers & Harrison's No. 1 Garza, in the Villa Pool, was abandoned as dry after reaching a total depth of 2,305 feet.

Duval County

Duval County marked up nine completions during the past week, eight of which were producers, and one dry hole. Seven wells were completed in the Government Wells Field and one in the Eagle Hill Pool. Humble Oil & Refining Co.'s No. 1-B Peters, a wildcat test in Survey No. 15, was abandoned as dry after drilling to a depth of 2,889 feet. In the Eagle Hill Pool, R. D. Kelley's No. 5 Foster was completed for 2 bbls. per hour, of which approximately 40 per cent was salt water, through a three-eighths inch choke. This test is on the south side of the Eagle Hill Pool and producing from the Government Wells sand. All other wells in the field are producing from the Cole sand.

In the Government Wells Field, Cox & Hamon's No. 5 State bottomed hole at 2,246 feet and has been completed for 83 bbls. per hour through open tubing. Magnolia Petroleum Co.'s No. 22 Duval County Ranch has been completed for 8 bbls. per hour through one-eighth inch choke at 2,338 feet. Sun Oil Co.'s No. 40 Weiderkehr made 22 bbls. per hour through three-quarters inch choke at 2,283 feet. No. 41 Weiderkehr was completed for 2 bbls. per hour, flush on open tubing with total depth of 2,254 feet. No. 42 Weiderkehr bottomed hole at 2,280 feet and made 32 bbls. per hour through three-eighths inch choke. Texas Co.'s No. 6 Duval County Ranch was completed for 10 bbls. per hour on gas lift at 2,318 feet. No. 12 Wendt was completed for 3 bbls. per hour at 2,242 feet.

Wildcat Operations in Southwest Texas

Week Ending March 24

BANDERA COUNTY

Company, well, farm name, section and block—	Remarks:
Palm-Winn Oil Co.'s (P. H. Winkle) No. 1 R. B. Watson, 600 ft. N of center of S line of tract in Sur. No. 71, 2 miles N from Medina City	T.D. 875 ft.; S.D.
Parkford et al's No. 1 Mrs. R. L. Duke, G.H.&S.A. Sur., Sec. 7	Material.
Peerless O. & G. Co.'s No. 1 Garrison Sur. No. 506, 1,500 ft. from N and 2,700 ft. from E lines of Sur. (3 mi. SW of Medina)	Location.

BASTROP COUNTY

Chas. E. Anderson's (Ca-Tex O. & G. Dev. Co.) No. 1 Pendergrass, 1,343 ft. from NE line, 310 ft. from SE line of 130-ac. tract in Henry Warnell Sur.	T.D. 1,718 ft.; set csg. 1,639 ft.; W.O.C.; T.D. 1,718 ft.
Anderson's No. 1 R. M. Trigg, J. Stewart Sur.	T.D. 1,713 ft.; W.O.C.; top Serp. 1,438 ft.; show oil 1,685-1,703 ft. in Serp.
Hinton et al's No. 1 Glass, 2,000 ft. from NW and 1,300 ft. from SW lines of Ferguson estate 239-ac. tract in Henry Warnell Sur.	Top Edwards 1,907 ft.; T.D. 1,909 ft.; showing sulphur water.
Marts & Bevins' No. 1 Lucy George, George Glasscock Sur., 4,200 ft. from NW line and 10,900 ft. from SW line of survey	Drlg. shale 1,250 ft.
Ogden & Reed's No. 1 Mrs. Landspear, E. Standifer Sur.	Drlg. 1,620 ft.
Don B. Megahan's No. 1 Charles Holcomb, 350 ft. NW of NW line of W. P. Watts' 75.5-ac. tract and 400 ft. NE of SW line of John W. Bunton Sur.	Top Serp. 1,687 ft.; T.D. 2,231 ft.; abnd.; base Serp. 2,067 ft.
Three Oil Co.'s No. 1 M. Ingram, H. S. Morgan Sur.	Derrick.

BEE COUNTY

Caeser Oil Co.'s No. 1 Pulling, F. Lewis Sur., 150 ft. from NW line, 150 ft. from SW line of 35-ac. tract	T.D. 100 ft.; S.D.

(Continued on Page 126)

Drilling Continuing Steadily in East Texas Area; Progress in Anderson-Leon County Tests

By L. E. BREDBERG

DALLAS, Tex., Mar. 26. — Reports from East Texas do not show much change in the "hot oil" situation, runs to refineries showing a drop of only about 2,000 bbls. per day and pipe line runs a drop of 3,000 bbls. per day. However, a temporary injunction against the Railroad Commission, to prevent its men from going on refinery properties as authorized by the new law, was dissolved March 24 in District Judge J. D. Moore's court at Austin, and the commission can now go ahead with checking refineries. This will no doubt be reflected in next week's reports.

Companies and independents are not letting up on drilling in the field. Sixty-nine wells were completed this week and 60 locations were staked. There are now 533 pumping wells and 27 are standing dead, but there may be many more "dead" wells than reported, some operators having let wells stand "dead" on their leases, taking the allowable of these wells from flowing wells. This practice is supposed to be eliminated by the new reports, operators are supposed to turn in, but the reports may not be correct.

Tide Water Oil Co. is checking the properties of the American Liberty Oil Co. (Golding and Murchison) with the intention of purchasing. The latter company has 127 wells on 1,544½ acres, the wells having a daily allowable of approximately 3,545 bbls. from 25 leases, all in the Henderson and Kilgore areas. These leases fall in the Pru, Ximinez, R. W. Smith, Penny, Berry, Cardena, Pena, Cordova, Van Winkle, Scott and Levi Sparks Surveys.

Record on Acreage

A late report from the field shows the 14 major producers holding the following amount of proven acreage:

Company—	No. of wells	Proven acreage	Acres per well
Humble O. & R. Co. ..	1,350	14,762	10.9
Gulf Prod. Co.	773	8,050	10.4
Sinclair Prairie O. Co.	643	7,478	11.6
Magnolia Pet. Co.	534	5,312	9.95
Atlantic Oil Prod. Co..	498	4,502	9.1
Sun Oil Co.	417	4,731	11.34
Tide Water Oil Co. ..	397	4,058	10 2
Shell Pet. Corp.	389	4,967	12.8
Mid-Kans. O. & G. Co.	388	5,216	13.44
Stanolind O. & G. Co.	299	4,440	14 85
Texas Co.	260	2,736	10.5
Yount Lee Oil Co. ..	205	2,322	11.3
Ark. Fuel Oil Co.	208	2,624	12.6
Hunt Prod. Co.	213	2,360	11.1

If the Magnolia Petroleum-East Texas Refining Co. deal is consummated it will place the Magnolia in second place in number of producing wells. If the Tide Water-American Liberty deal is consummated it will place Tide Water fifth in number of producing wells and acreage.

Otto Morris' No. 1 F. L. Bradley in the J. Scott Survey, approximately 1¾ miles southwest of Jamestown and 1½ miles northeast of Mattox' No. 1 Starr producer, north of the main body of the East Texas Field, will pave the way to more drilling in this area due to its showing over 800 feet of oil in eight minutes, the oil testing 38 degrees gravity.

The test of Byrd-Frost and others on the Alice Scott farm in the Joseph Crawford Survey, 1½ miles northwest of Slocum, in south central Anderson County, topped the Pecan Gap chalk at 4,400 feet and is drilling below 4,455 feet, running far lower than the nearest test, previously drilled by Humble Oil & Refining Co.

Cayuga Area

Tide Water Oil Co. and Texas Seaboard Oil Co.'s No. 1 Wills, in the Cayuga area, northwestern Anderson County, topped the Pecan Gap chalk at 2,177 or 2,188 feet according to company men, an uncertainty as to the depth at which the chalk was topped not being settled. The driller called the top at 2,116 feet. It is now drilling below 2,400 feet. Elevation (derrick floor) is 312 feet.

Same companies' No. 1 Rampy, in the James Wilson Survey, Anderson County, and their No. 1 Wortham, same area, are both spudding. Elevation of the former is 291 feet and the latter 317 feet.

The last 24 hours' production of the Cayuga discovery was 493 bbls., showing a steady flow through chokes.

Freestone County

Daniels Oil & Royalty Co.'s No. 1 P. D. C. Ball in the Jose Ignacio Auguilera Survey, a short distance south of Turlington in Freestone County, is drilling at 1,250 feet in sandy shale after staking location last week. This test is making good time and will soon prove whether the area is to be condemned or an oil or gas field discovered. Shell Petroleum Corp. "shot" this area with instruments about three years ago, and has recently reworked it, as have other companies, and a large block was previously leased around Turlington by Shell, others taking protection acreage. It is about midway between the Long Lake area in Anderson County and the Mexia Field in Limestone County, to the west.

McElreath and Suggett have a derrick erected on their C. D. Franklin location in the Stephen Hatton Survey, 4 miles west of Brownsboro in Henderson County, and W. J. Keeling and others have staked location for No. 1 H. C. Tucker in the Henry Ford Survey, 3 miles southwest of Richardson in Navarro County.

Other tests are proposed for Henderson County, a county which has had considerable testing during the past four years, but more especially during the past year and a half when several dry holes were abandoned. The Cayuga strike, just over the southern line, in Anderson County has lent an impetus to further drilling.

Humble Oil & Refining Co. has staked a location on its block near Friendship, in the northwest part of Smith County. It is on the H. C. Tucker farm in the J. Bell No. A-160 Survey, 3 miles southwest of Friendship. The block is approximately 6 miles west of the nearest production on the west side of Gregg County.

Leon County

Shell Petroleum Corp. and others' No. 1 Lee in the William Cooper Survey, northwest of the Beggs gas discovery of the same operators, Leon County, is making another drill stem test. It formerly tested 10,000,000 feet of gas. Total depth is 5,673 feet, and sand having a slight showing of oil was cored from 5,663-73 feet. It is on a different structure than the Beggs gasser, has been running higher structurally, and considered as having better chances for making an oil producer than the Beggs area to the southeast.

Van Field

There are seven tests drilling in the Van Field, Van Zandt County, and two more locations were staked by Pure Oil Co. this week. One well was completed in the field during the week by Shell Petroleum Corp., and another is destined to be completed by Pure Oil Co. next week. Another well will be completed this week if tubing and packer are fished out in time.

A meeting of Texas producers is to be held in Dallas on March 30 to discuss proration enforcement.

East Central Texas Wildcats

Week Ending March 26

ANDERSON COUNTY

Company, well, farm name, section and block—	Remarks
Pete Burton et al's No. 1 Freeman Baptist Church, 105 ft. due W of NW cor. of W. Chancellor Sur. in center of a 2-ac. tract, W. T. Meredith Sur.	Location.
Byrd-Frost et al's No. 1 Alice Scott, 2,200 ft. from N and 700 ft. from E lines of Joseph Crawford Sur., 1¼ miles NW of Slocum	Drlg. 4,382 ft.
Standard of Kansas' No. 1 A. W. Johnson, 665 ft. from N line, 420 ft. from E and W lines of 22.8-ac. tract, Simon Sanches Sur.	Derrick.
Tide Water Oil Co. and Texas Seaboard Oil Co.'s No. 1 Annie Wills, 1,400 ft. from W and 3,600 ft. from N lines of the E. Edmondson Sur., 5,400 ft. NE of discovery well	Set surface csg. 384 ft.
Tide Water Oil Co. and Texas Seaboard Oil Co.'s No. 1 L. A. Rampy, 467 ft. from S and W lines of Rampy 103.38-ac. tract, James Wilson Sur.	Rig up.
Tide Water Oil Co. and Texas Seaboard Oil Co.'s No. 1 W. C. Wortham, 467 ft. out of most westerly SW cor. of Wortham 100.87-ac. tract	Rig up.
Tide Water Oil Co. and Texas Seaboard Oil Co.'s No. 5 Monnig, 2,799 ft. N and 933 ft. E of No. 1, Simon Sanches Sur. No. 1	Plugged back to 5,255 ft.; T.D. 5,280 ft.

BOWIE COUNTY

R. W. Lynn and W. R. Rolfe's No. 1 Mrs. R. D. Hart, 330 ft. out of NE cor. of Hart 20-ac. tract, 1 mile E of Nash, Thomas Price Sur.	Location.

CHEROKEE COUNTY

A. R. Lewis et al's No. 1 J. Bradford, 1,600 ft. from W line and 200 ft. from N line of 50-ac. tract, J. Laprella Sur.	Derrick.
A. F. Richardson's No. 1 P. Wood, 660 ft. from N line, 3,300 ft. from E line of 498-ac. tract, 14 miles E of Jacksonville, on Cherokee-Rusk County line, Ignacio Sanches Sur.	Derrick.

FANNIN COUNTY

L. Kean et al's No. 1 L. M. Boyd, 900 ft. from E line and 200 ft. from N line of survey, W. Hunt Sur.	Drlg. 1,710 ft.

FREESTONE COUNTY

Clyde Creighton's No. 1 Holly Bros., 854 ft. from W and center N and S lines of lease, A.B.&M. Sur.	T.D. 5,140 ft.
Daniels Oil & Royalty Co.'s No. 1 P. D. C. Ball, 10,380 ft. from S line and 1,980 ft. from W line of survey, Jose Ignacio Auguilera Sur.	Drlg. 1,250 ft. in sandy shale.

(Continued on Page 126)

COMPLETIONS IN EAST TEXAS

North Gregg County

Arkansas Fuel Oil Co.'s No. 5-B Lathrop, top sand 3,547 feet, initial production 43 bbls. in one-half hour through open tubing, total depth 3,571 feet; No. 6-A McKinley, top sand 3,602 feet, initial production 37 bbls. in one-half hour through open tubing, total depth 3,627 feet; No. 4-B Smith, top sand 3,509 feet, initial production 32 bbls. in one-half hour through open tubing, total depth 3,534 feet. Barnsdall Oil Co.'s No. 11 Adams, top sand 3,500 feet, initial production 48 bbls. in one-quarter hour through open tubing, total depth 3,620 feet. Empire Gas & Fuel Co.'s No. 9 Bumpass, top sand 3,485 feet, initial production 27 bbls. in one-quarter hour through open tubing, total depth 3,547 feet. Fain & McGaha's No. 6 W. A. Bauknight, top sand 3,596 feet, initial production 40 bbls. in one-quarter hour through open tubing, total depth 3,647 feet. Humble Oil & Refining Co.'s No. 7 W. C. Mackey, top sand 3,626 feet, initial production 14 bbls. in one-quarter hour through open tubing, total depth 3,635 feet. Navarro Oil Co.'s No. 6 T. B. Harris, top sand 3,507 feet, initial production 43 bbls. per hour through 1½-inch tubing choke, total depth 3,528 feet. Sabinas Oil Corp.'s No. 4-A T. M. Collins, top sand 3,668 feet, initial production 75 bbls. in one-half hour through open tubing, total depth 3,688 feet.

Sinclair Prairie Oil Co.'s No. 11 Isley, top sand 3,523 feet, initial production 32 bbls. in one-quarter hour through open tubing, total depth 3,552 feet. Stanolind Oil & Gas Co.'s No. 5 J. F. White, top sand 3,626 feet, initial production 19 bbls. in one-quarter hour through 1-inch tubing choke, total depth 3,696 feet. J. O. Whittington's No. 4 Boyd, top sand 3,593 feet, initial production 100 bbls. per hour through open tubing, total depth 3,628 feet; No. 6 J. M. Bumpass, top sand 3,520 feet, initial production 45 bbls. in one-half hour through open tubing, total depth 3,559 feet. Woodley Petroleum Co.'s No. 4 T. B. Harris, top sand 3,532 feet, initial production 20 bbls. in one-quarter hour through open tubing, total depth 3,550 feet. Yount Lee Oil Co.'s No. 8 Minnie Jones, top sand 3,547 feet, initial production 63 bbls. through eleven-sixteenths inch tubing choke, total depth 3,587 feet; No. 2 Skipper-Gardner, top sand 3,533 feet, initial production 58 bbls. per hour through eleven-sixteenths inch tubing choke, total depth 3,541 feet.

South Gregg County

Arkansas Fuel Oil Co.'s No. 7 Calvin Brown, top sand 3,559 feet, initial production 45 bbls. in one-half hour through open tubing, total depth 3,582 feet. Continental Oil Co.'s No. 3 A. A. King, top sand 3,685 feet, initial production 22 bbls. in one-quarter hour through open tubing, total depth 3,700 feet. Empire Gas & Fuel Oil Co.'s No. 6 E. L. Walker, top sand 3,578 feet, initial production 250 bbls. in one-quarter hour through open tubing, total depth 3,589 feet. Gulf Production Co.'s No. 24 A. Spear, top sand 3,537 feet, initial production 50 bbls. per hour through open tubing, total depth 3,562 feet; No. 11 R. H. Still, top sand 3,506 feet, initial production 30 bbls. per hour through open tubing, total depth 3,510 feet. E. M. Harter and others' No. 5 S. G. Andrews,

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Ector County Completion One of Best in Field; Sixty-Three Locations in Wichita Falls Area

By L. E. BREDBERG
Fort Worth Bureau, The Oil and Gas Journal

FORT WORTH, Tex., Mar. 26.—Developments in the West Texas district during the week were confined to the completions of six wells for a daily initial production of 42,120 bbls. and the staking of 10 locations, two of which are old wells in Runnels County that will be reworked and treated with acid.

In Ector County, Stanolind Oil & Gas Co. has completed No. 5 J. M. Cowden as one of the best wells in the field. It is in Section 27, Block 43, Township 1n, T.&P. Survey. It was drilled to a total depth of 4,321 feet and plugged back to 4,268 feet where it was shot from 4,153-68 feet. In 15 hours it flowed 555 bbls. Before being shot the well flowed 200 bbls. daily. Same company's No. 5 J. M. Cowden in Section 34, Block 43, Township 1n, T.&P. Survey, also has the appearance of making a nice well. In drilling to 4,140 feet the hole had filled with oil after getting an increase in oil and gas from 4,134-37 feet. First oil and gas showing was struck at 3,975 feet, with increases logged at 4,025 and 4,055 feet.

Runnels County

Two old tests in Runnels County which were drilled several years ago are now being cleaned out and will be treated with acid. The old gasser drilled by Watchorn Oil Co. on the King farm southwest of the McMillan Pool has been taken over by the Roberts Oil Corp. of Breckenridge. It was drilled to 3,739 feet and is standing with 2,500 feet of water in the hole and enough gas to head water over the rig. The water will be plugged off, and the hole shot and treated with acid.

The other test to be treated is the old wildcat drilled by Gibson and Johnson in 1929 on the L. P. Wood land which had a showing of oil in the lime formation from 3,485-95 feet. L. L. Evans and others of Brownwood have taken it over and will redrill before treating. It is in the T. Williams Survey No. 529, southeast of the McMillan Pool.

Two semiwildcat tests were made in Runnels County. Melrose Oil Co. has rig up for No. 1 L. P. Wood, 1¾ miles west and one-half mile south of the Watchorn gasser, in the Willett Holmes Survey No. 100. The other test will be drilled by Agnew and Currie on the H. E. Wade farm in the Domingo Diaz Survey No. 532 and will be drilled to 3,500 feet.

Ordovician Tests

No important change in formation has been made by Humble Oil & Refining Co.'s wildcat Ordovician test in Pecos County. It is coring below 8,611 feet, 579 feet below the reported top of the Simpson, middle series of the Ordovician. It is on the White and Baker ranch in Section 44, Block Z, T.C. Ry. Survey. Gulf Production Co.'s No. 103 McElroy, Upton County, also in search of the Ordovician, is coring below 9,408 feet in black shale and lime.

The old test of George T. Wilson in Schleicher County which is being deepened to the Ordovician by J. M. Cooper of Los Angeles ran into trouble during the week. After making 10 feet of new hole fire broke out in the engine house, presumably started by a spark from the engine, and ruined the equipment. The equipment will be replaced and the hole carried down as soon as possible. It is on the Bert Page land in Section 40, Block L, L.T.C. Ry. Survey. Old total depth is 5,053 feet.

Jones County

In Jones County C. P. Campbell's No. 3 Herndon has not been tested and it will probably be another week before one can estimate just what kind of a well the test will make. It is standing with 1,200 feet of oil in the hole and has made one 10-bbl. head. Total depth is 2,490 feet, 2 feet in the pay which was topped at 2,488 feet. The test is 3 miles southeast of Anson in Section 6, M.E.P. &P. Survey. In the same county Knight, Baker and Pardue are drilling below 1,785 feet on their No. 1 A. W. Hill located in Block 4, A. W. Hill Survey.

Loving County

Two locations were made in the Wheat Pool, Loving County. The California Oil Co.'s No. 8 Reagan-McElvain has been located in Section 84, Block 1, W.&N.W. Survey. H. W. Martin's No. 4 Wheat is located in Section 83, Block 1, W.&N.W. Survey.

Yates Field

In the Yates Field, Pecos County, Mid-Kansas Oil & Gas Co. completed No. 7 Fred Turner in Tract No. 1, for 40,826 bbls., topping the pay at 1,210 feet. It flowed 1,701 bbls. per hour and was bottomed at a total depth of 1,450 feet. The same company has made two more locations in the field; No. 33-B Yates is in Section 61, I.&G.N. Survey, and No. 34-B is in the same section.

In the Taylor Link Field, Pecos County, Taylor Link Oil Co. treated No. 1 University with acid during the week. Before running 1,000 gallons of acid and an 80-bbl. oil load under 300 pounds pressure the discovery well was pumping only 2 bbls. of oil daily; after treatment on proration gauge it pumped 130 bbls. Sixteen wells in this field have been successfully treated with acid, only one well failing to respond to treatment. The allowable from the field which has a total of 57 wells is 1,250 bbls.

Menard County

James L. Duffey and John C. Chidester have derrick up for a wildcat test in northwestern Menard County. The test is in Section 23, T.&N.O. Survey, on the W. J. Wilkinson, Jr.'s land, and will be drilled to 3,000 feet.

Fisher County

Merry Brothers and Perini's No. 1 J. J. Steele, in Section 210, B.B.B.&C. Survey, Fisher County, was treated with acid during the week and swabbed 500 bbls. in 24 hours. It was drilled into the lime pay at 2,915-32 feet. Top of the lime pay was logged at 2,880 feet. In the northeast part of the county and one-quarter mile north of the old Roeser-Pendleton and Amerada producer in the Royston Pool, Texas Inland Oil Co.'s No. 1 First National Bank of Hamlin, in Section 191, B.B.B.&C. Survey, is still shut down for storage. The hole filled up in 30 hours and slopped over from pay topped at 3,082-3,102 feet. It has the appearance of making a nice well when it is tested.

Humble Pipe Line Co. is laying 2 miles of 3-inch pipe line from the Noodle Creek Pool in southwest Jones County, to its main line. The line will be connected to nine wells on five leases in the pool and will take 300 bbls. daily from the wells. Oil from the wells has heretofore been trucked out.

Ward County

In Ward County, the Tex-Mex Oil Co. has made location for No. 3-B Shell-Sloan, in Section 16, Block 5, H.&T.C. Survey. One good well was registered in the Hutchins-O'Brien area in Ward County. Gulf Production Co.'s No. 25 Hutchins topped the pay at 2,538 feet, and was completed for an initial production of 663 bbls. of oil per day, with the hole bottomed at 3,064 feet. The same company has four other active wells in this area, two in the Hutchins area, and two in the O'Brien area.

WICHITA FALLS

There were 49 completions in the Wichita Falls district this week and 63 locations. Thirty-four of the completions were in Archer County alone. This county, especially in the saturated lime areas, has been and will remain the most active area in the district for months to come as acid treatment usually makes high producers out of tests that otherwise would be but small wells. Wichita and Young Counties are the next most active counties.

W. Hammon is now completing the second well, No. 14 T. F. Mitchell, in a new sandy lime area of Wichita County. It logged lime from 1,792-1,801 feet and swabbed 100 bbls. natural. After treating with 1,000 gallons of acid with 105 bbls. oil load, no pressure, it swabbed 110 bbls. in four and one-half hours. Leasing activity in this area has been brisk and eight new locations have just been staked with 25 drilling operations now active.

Another saturated lime pool may be opened by Panhandle Refining Co.'s No. 1 J. L. Anderson in Block 18. It logged saturated lime from 1,388-94 feet. It is 4,000 feet southwest of the new lime pool in the W half Section 2, S.P.R.R. Survey, Abstract 1,237, Archer County.

Pitzer and West's No. 2 R. Morrison in Section 431, T.E.&L. Survey, one-half mile north of the James Pool, Young County, completed three weeks ago for a much smaller well, was treated with 3,000 gallons of acid and made 100 bbls. per hour after the hole was cleaned. It logged saturated lime from 3,834-3,970 feet, and has proved one of the best wells yet treated in the area. Four new locations were staked around the well within the next two days and activities have increased since.

Hinson, Tidwell and Lindsey Drilling Co. of Graham have purchased a lease in the James Pool area; the west 30 acres of the north 60 acres of the east 140 acres of T.E.&L. Survey No. 457, and will drill three 4,000-foot tests as consideration for the lease. This lease offsets a 40-bbl. well producing from the 3,900-foot lime.

Purchased by Humble

Humble Oil & Refining Co. has purchased the McKnight ranch, consisting of some 4,465 acres. It is 2 miles northwest of a producing block owned by the company, and was purchased for the purpose of drilling saturated lime tests. This ranch and block is in Throckmorton County. The same company has purchased a two-thirds interest in a 1,600-acre block centering in the NE Section 28, Block 1, H.&G.N. Survey. Purchase was made from M. G. Cheney of the Anzac Oil Corp. of Coleman, and the former company is to drill a 3,300-foot test on the block.

The Wichita Falls district produced a daily average of 60,710 bbls. during the week. This is an increase of around 2,100 bbls. per day over the previous week's figures.

A. V. Jones and H. R. Stasney have geologized and assembled a block of 2,000 acres on the Nail ranch in northwest Shackelford County. Blair Baker and others are now drilling in Section 124, E.T.R.R. Survey, on a block formerly assembled by the above named men and another test is to be drilled on the new block a few miles to the south of the present test.

Carl S. Leidecker of Dallas has just completed a well, pumping 198 bbls. in 12 hours from sand logged at 3,218-3,321 feet. It is 1½ miles northwest of production in Block 2,741, an area that has been producing for about five years.

Wildcat Operations in West Texas

Week Ending March 26

ANDREWS COUNTY

Company, well, farm name, section and block—	Remarks:
Fuhrman Pet. Co.'s No. 1-B Bonner, 1,320 ft. from N line and 1,320 ft. from E line of Sec. 25, Blk. A-43, P.S.L. Sur.	Drlg. 1,958 ft.
Humble Oil & Ref. Co.'s No. 1 R. M. Means, 660 ft. from N and 660 ft. from E of Sec. 2, Blk. 2-35, P.S.L. Sur.	Standardizing; T.D. 1,870 ft.
Humble Oil & Ref. Co.'s No. 1 Kuykendall, 1,920 ft. from S and E lines of Sec. 24, Blk. A-46, P.S.L. Sur.	Drlg. 805 ft.
Llano Oil Co.'s No. 1 J. E. Parker, 330 ft. from N line, 990 ft. from E line of Sec. 18, Blk. A-44, P.S.L. Sur.	Location.

BREWSTER COUNTY

C. P. Link and Joiner's No. 1 McIntire, 853 ft. from S, 2,390 ft. from E of Sec. 31, Blk. 352, W. M. Mitchell Sur.	S.D. 1,417 ft.

COKE COUNTY

Wm. Hooper's No. 1 Gaston, 240 ft. from S line and 654 ft. from W line of Joseph Sur. No. 11	S.D. 1,365 ft.

CRANE COUNTY

Gulf Prod. Co.'s No. 1 Edwards, 330 ft. from S line and 330 ft. from E line of Sec. 21, Blk. B-18, Public School Land Sur.	Drlg. 4,344 ft.
Storey, Frievele & Duffy's No. 1 G. L. Brown et al, 330 ft. from N and E line of Sec. 34, Blk. 43, Twp. 4s, T.&P. Sur.	Drlg. 3,175 ft.
Wahlenmaier Petroleum Corp.'s No. 1 W. P. Edwards, 330 ft. from N and 330 ft. from E of SW cor. of the NE of Sec. 12, Blk. B-23, P.S.L. Sur.	Drlg. 215 ft.

CROCKETT COUNTY

Porter Rankin's No. 1 Todd, 1,500 ft. from N line and 3,020 ft. from E line of Sec. 68, Blk. UV, G.C.&S.F. Sur.	Drlg. 750 ft.
J. D. Young's No. 1 Shannon, 330 ft. from W line, 330 ft. from N line of Sec. 35, Blk. 1, G.C.&S.F. Sur.	S.D. 2,635 ft.

CULBERSON COUNTY

Miller Bros.' No. 1 fee, 1,900 ft. from N and 660 ft. from E line of Sec. 21, Blk. 97, P.S.L. Sur.	S.D. 1,065 ft.

DAWSON COUNTY

Ray Albaugh et al's No. 1 John Robinson, 1,320 ft. from N line, 1,320 ft. from W line of Sec. 46, Blk. M, E.L.R.R. Sur.	Underreaming at 1,700 ft.

(Continued on Page 124)

Three offset locations have been made to the newly discovered extension.

COMPLETIONS IN WEST TEXAS

Pecos County

Cardinal Oil Co.'s No. 19-E Tippett, total depth 585 feet, plugged back to 557 feet, top pay 510 feet, initial production 60 bbls. of oil plus 9 per cent water, in 24 hours' pumping. Mid-Kansas Oil & Gas Co.'s No. 7 Fred Turner, Jr., top pay 1,210 feet, initial production 1,701 bbls. per hour, total depth 1,450 feet.

Glasscock County

Simms Oil Co.'s No. 5-A Coffee, top pay 2,103 feet, initial production 17 bbls. per hour, total depth 2,141 feet.

Ward County

Gulf Production Co.'s No. 25 Hutchins, top pay 2,538 feet, initial production 663 bbls. per day, total depth 2,141 feet.

Winkler County

Colonial Oil Co.'s No. 2 State-Scarborough, top pay 2,895 feet, initial production 163 bbls. in 24 hours, total depth 3,064 feet.

COMPLETIONS IN WICHITA FALLS

Archer County

Burns & Long's No. 5 Mankins, dry and abandoned, total depth 700 feet; No. 6-R Wilson, oil sand 1,441-48 feet. initial production 100 bbls., total depth 1,448 feet. Continental Oil Co.'s No. 6-D Falls County, lime 1,071-91 feet, initial production 80 bbls. in five hours, total depth 1,091 feet, treated with acid. W. R. Cooper's No. 6 G. B. Hamilton, oil sand 1,095-1,103 feet, initial production 75 bbls., total depth 1,103 feet. Cullum & Alexander's No. 9 Falls-Gulf, lime 1,095-1,113 feet, initial production 75 bbls. swabbing per hour, total depth 1,113 feet, treated with acid. Deep Oil and Lindsey Drilling companies' No. 4 Wilson, oil sand 2,200-21 feet, initial production 70 bbls., total depth 2,221 feet. Fain & McGaha and Humble Oil & Refining Co.'s No. 17 Logan, lime 1,106-15 feet, initial production 100 bbls., total depth 1,115 feet, treated with acid. Golding & Cochran's No. 1 Hausler, oil sand 1,123-28 feet, initial production 25 bbls., total depth 1,128 feet.

W. B. Hamilton's No. 12 Coffield, lime 1,194-1,208 feet, initial production 126 bbls., total depth 1,208 feet, treated with acid. Hines and Texas Co.'s No. 3 Farmers-Perkins, lime 1,400-05 feet, initial production 51 bbls., total depth 1,405 feet, treated with acid. Huggins Oil Co.'s No. 1-C Parkey, oil sand 1,584-86 feet, initial production 15 bbls., total depth 1,586 feet. Iron Mountain Oil Co.'s No. 1 Logan, dry and abandoned, total depth 1,261 feet. W. E. Maxson's No. 1-C Perkins, lime 1,472-86 feet, initial production 15 bbls., total depth 1,486 feet, treated with acid. Perkins & Cullum's No. 15 Boyles, lime 1,148-62 feet, initial production 150 bbls., total depth 1,162 feet, treated with acid. Petroleum Producers Co.'s No. 5 Richardson, oil sand 1,258-63 feet, initial production 35 bbls., total depth 1,263 feet. Pois & Shultz' No. 18 Green, lime 1,117-36 feet, initial production 200 bbls., total depth 1,136 feet. Rathke Oil Co.'s No. 1-B Benson, dry and abandoned, total depth 952 feet. J. H. Turner's No. 1 Lyles, dry and abandoned, total depth 1,768 feet. Womack Oil Co.'s No. 7 Perkins, lime 1,478-90 feet, initial production 12 bbls., total depth 1,490 feet, treated with acid.

Jack County

Bryson Oil & Gas Co.'s No. 1 Loving, oil sand 3,317-21 feet, initial production 175 bbls., total depth 3,321 feet.

Young County

Beaver-White & Duncan's No. 3 Remington-Belknap, lime 580-92 feet, initial production 35 bbls., total depth 592 feet. Brek Oil Co.'s No. 3 Newman, oil sand 532-33 feet, initial production 5 bbls., total depth 533 feet. B. C. Gilmore's No. 3 Drum, oil sand 444-90 feet, initial production 5 bbls., total depth 490 feet. King Royalty Co.'s No. 16-A Johnson, oil sand 575-93 feet, initial production 1 bbl., total depth 594 feet. C. J. Kleiner's No. 12 Belknap Coal Co., oil sand 706-10 feet, initial production 125 bbls., total depth 710 feet. Charles Knox's No. 6 Manning, oil sand 2,690-2,719 feet, initial production 321 bbls., total depth 2,719 feet.

L. O. Nix's No. 1 Belknap Coal Co., dry and abandoned, total depth 727 feet. Pitzer & West's No. 2 Morrison, lime 3,834-3,970 feet, initial production 80 bbls. per hour, total depth 3,970 feet, treated with acid. G. C. Rounaville's No. 1 Meltin, dry and abandoned, total depth 600 feet. Texas Co.'s No. 1 McDonald, dry and abandoned, total depth 702 feet. D. L. Wolfe's No. 1 Johnson, dry and abandoned, total depth 703 feet.

Wichita County

C. W. Whitaker and others' No. 1 H. L. Hodges, dry and abandoned, total depth 680 feet.

Wilbarger County

Easter Oil Co.'s No. 3-E Waggoner, oil sand 1,877-80 feet, initial production 110 bbls., total depth 1,880 feet.

International Petroleum Exposition List of Exhibitors Signed for Tulsa Show

The list of exhibitors to date for the International Petroleum Exposition at Tulsa, May 12-19, follows:

Advertising Novelties Co., Tulsa; Air Reduction Sales Co., New York; Alligator Co., St. Louis, Mo.; Allis, Louis, Co., Milwaukee, Wis.; Allis-Chalmers Manufacturing Co., Milwaukee, Wis.; Allis-Chalmers (tractor division), Wichita, Kans.; Allsteel Products Co., Wichita, Kans.; Aluminum Co. of America, Pittsburgh, Pa.; American Air Filter Co., Louisville, Ky.; American Association of Petroleum Geologists; American Cable Co., Wilkes Barre, Pa.; American Can Co., Chicago; American Glycerine Co., Wilmington, Del.; American Hammered Piston Ring Co., Baltimore, Md.; American Iron & Machine Works Co., Oklahoma City, Okla.; American LaFrance & Foamite Industries, Inc., Elmira, N. Y.; American Petroleum Institute; American Rolling Mill Co., Middletown, Ohio; American Steel & Wire Co., Chicago; Ames-Baldwin Wyoming Co., Parkersburg, W. Va.; Appleton Electric Co., Chicago; Athey Truss Wheel Co., Chicago; Atlas Supply Co., Muskogee, Okla.; Automatic Valve Controller Co., Tulsa.

Baash-Ross Tool Co., Los Angeles, Calif.; Bailey Meter Co., Cleveland, Ohio; Baker Oil Tools, Inc., Tulsa; Baldwin Duckworth Chain Corp., Worcester, Mass.; Baroid Sales Co., Los Angeles, Calif.; Bastian-Blessing Co., Chicago; Bausch-Lomb Optical Co., Rochester, N. Y.; Beebe Brothers Co., Seattle, Wash.; Bendix Products Corp., South Bend, Ind.; Benjamin Electric Co., Des Plaines, Ill.; Big Three Welding Co., Tulsa; Black-Sivalls & Bryson Co., Oklahoma City, Okla.; Blackmer Pump Co., Grand Rapids, Mich.; Bobst Motor Co., Tulsa; Bovaird Supply, Co., Tulsa; Bridgeport Machine Co., Wichita, Kans.; Bristol Co., St. Louis, Mo.; Brown Instrument Co., Philadelphia, Pa.; Buda Co., Harvey, Ill.; Butler Manufacturing Co., Kansas City, Mo.

Calorizing Co., Pittsburgh, Pa.; Camp, C. F., Co., Tulsa; Caterpillar Tractor Co., Peoria, Ill.; Central Forging Co., Catawissa, Pa.; Century Electric Co., St. Louis, Mo.; Chain Belt Co., Milwaukee, Wis.; Champion Rivet Co., Cleveland, Ohio; Champion Machine & Forging Co., Cleveland, Ohio; Chaplin Fulton Manufacturing Co., Pittsburgh, Pa.; Chicago Bridge & Iron Co., Tulsa; Chicago Pneumatic Tool Co., Oklahoma City, Okla.; Cincinnati Advertising Products Co., Cincinnati, Ohio; Cities Service Oil Co., Tulsa; Clark Brothers Co., Tulsa; Cleveland Chain Co., Cleveland, Ohio; C-O-Two Fire Equipment Co., Newark, N. J.; Coffing Hoist Co., Danville, Ill.; Compton & Sons, St. Louis, Mo.; Continental Can Co., New York; Continental Supply Co., Dallas, Tex.; Cook, C. Lee, Manufacturing Co., Louisville, Ky.; Corby Supply Co., St. Louis, Mo.; Crouse-Hinds Co., Tulsa; Culmore, W. M., Dallas, Tex.; D. & B. Pump & Supply Co., Dallas, Tex.; Darling Valve & Manufacturing Co., Williamsport, Pa.; Dearborn Chemical Co., Kansas City, Mo.; Deep Rock Oil Corp., Tulsa; DeLaval Separator Co., Chicago; DeLaval Steam Turbine Co., Trenton, N. J.; De La Vergne Engine Co., Philadelphia, Pa.; Detroit Hoist & Machine Co., Detroit, Mich.; Doheny Stone Drill Co., Los Angeles, Calif.; Dover Stamping & Manufacturing Co., Cambridge, Mass; Driftmeter Co., Tulsa; Durametallic Co., Kalamazoo, Mich.

Eagle Picher Lead Co., Cincinnati, Ohio; Eastman Manufacturing Co., Manitowoc, Wis.; Edison Splitdorf Corp., West Orange, N. J.; Economy Electric Lantern Co., Chicago; Electric Eye Display; Elliott Co., Jeanette, Pa.; Emsco Derrick & Equipment Co., Dallas, Tex.; Erie Meter Systems, Erie, Pa.

Fairbanks-Morse Co., Beloit, Wis.; Falk Corp., Milwaukee, Wis.; Fargo Motors Corp., Detroit, Mich.; Farrar & Trefts, Inc., Buffalo, N. Y.; Fix, George J., Co., Dallas, Tex.; Fisher Governor Co., Marshalltown, Iowa; Foote Brothers Gear & Machine Co., Chicago; Ford Motor Co., Detroit, Mich.; Four Wheel Drive Auto Co., Clintonville, Wis.; Foxboro Co., Boston, Mass.; France Packing Co., Philadelphia, Pa.; Frates Co., Tulsa; Frick Reid Supply Co., Tulsa.

Gardner-Denver Co., Quincy, Ill.; Garlock Packing Co., Palmyra, N. Y.; Gaso Pump Burner & Manufacturing Co., Tulsa; Gates Hardware Co., Tulsa; Gearench Manufacturing Co., Houston, Tex.; General Electric Co., Schenectady, N. Y.; General Metallizing Co., Tulsa; General Paint Corp., Tulsa; General Porcelain Enamel & Manufacturing Co., Chicago; General Scientific Apparatus Display; Glen Dial, Inc., Tulsa; Globe Steel Tubes Co., Milwaukee, Wis.; Goodrich Electric Co., Chicago; Goodrich, B. F., Rubber Co., Akron, Ohio; Green, A. P., Fire Brick Co., Mexico, Mo.; Grolier Society of London, Kansas City, Mo.; Guiberson Corp., Dallas, Tex.; Guiberson Diesel Engine Co., Dallas, Tex.; Gulf Publishing Co., Houston, Tex.; Gustin Bacon Manufacturing Co., Kansas City, Mo.

Handy Governor Corp., Detroit, Mich.; Hanlon-Waters, Inc., Tulsa; Happy Belting Co., Tulsa; Harnischfeger Sales Corp., Milwaukee, Wis.; Haynes Stellite Co., Kokomo, Ind.; Hazard Wire Rope Co., Wilkes Barre, Pa.; Hercules Motor Corp., Canton, Ohio; Hercules Tool Co., Tulsa; Hewitt Rubber Co., Buffalo, N. Y.; Hinderliter Tool Co., Tulsa; Robart Brothers Co., Troy, Ohio; Huffman Manufacturing Co., Dayton, Ohio; Hughes Tool Co., Oklahoma City, Okla.; Hydril Co., Los Angeles, Calif.; Hyatt Roller Bearing Co., Newark, N. J.

Ideal Electric Co., Oklahoma City, Okla.; Illinois Steel Co., Tulsa; Independent Eastern Torpedo Co., Tulsa; Ingersoll-Rand, Inc., Dallas, Tex.; International Harvester Co., Chicago; International Nickel Co., New York; International Derrick & Equipment Corp., Columbus, Ohio; Iverson Tool Co., Tulsa.

Jarecki Manufacturing Co., Tulsa; Jones, S. M., Co., Toledo, Ohio; Jones & Laughlin Steel Co., Pittsburgh, Pa.; Jones, J. Edward, New York; Joyce Cridland Co., Dayton, Ohio.

K-W Ignition Co., Cleveland, Ohio; Kerotest Manufacturing Co., Pittsburgh, Pa.; Kerr Turbine Co., Jeanette, Pa.; Key Boiler Equipment Co., E. St. Louis, Ill.; Kidde, Walter, & Co., New York; Kinley, M. M., Co., Tulsa.

Lagonda Manufacturing Co., Springfield, Ohio; Landis Machine Co., Waynesboro, Pa.; Landry, Max E., Oklahoma City, Okla.; Leavitt Machine Co., Orange, Mass.; Lee Tire & Rubber Co., Conshohocken, N. Y.; Leland Equipment Co., Tulsa; Liberty Manufacturing Co., Jeannette, Pa.; Lincoln Electric Co., Cleveland, Ohio; Linde Air Products Co., New York; Link Belt Co., Chicago; Lubrikup Co., Williamsport, Pa.; Lunkenheimer Co., Cincinnati, Ohio; Lufkin Foundry & Machine Co., Lufkin, Tex.

McCord Radiator & Manufacturing Co., Detroit, Mich.; McIntosh & Seymour Corp., Auburn, N. Y.; McKee, Arthur G., & Co., Cleveland, Ohio; MacClatchie Manufacturing Co., Compton, Calif.; Macnick Co., Tulsa; Magneto Ignition Corp., Tulsa.; Maloney Tank Manufacturing Co., Tulsa; Manzel Brothers Co., Buffalo, N. Y.; Marathon Oil Co., Tulsa; Martin Decker Corp., Long Beach, Calif.; Massillon - Cleveland - Akron Sign Co., Massillon, Ohio; Mason-Neilan Regulator Co., Boston, Mass.; Mechanical Rubber Co., New York; Merco Nordstrom Valve Co., Pittsburgh, Pa.; Mid-Continent Petroleum Corp., Tulsa; Midland Chamber of Commerce, Midland, Tex.; Midwest Equitable Meter Co., Tulsa; Midwest Piping & Supply Co., Tulsa; Mine Safety Appliance Co., Pittsburgh, Pa.; Mission Manufacturing Co., Houston, Tex.; Modern Engineering Co., St. Louis, Mo.; Moore, Lee C., & Co., Tulsa; Moorlane Co., Tulsa; Morrison Brothers Co., Dubuque, Iowa; Motor Improvements, Inc., Newark, N. J.; Multi Metal Wire Cloth Co., New York; Muskogee Iron Works, Muskogee, Okla.

National Carbide Sales Corp., New York; National Equipment Corp., Milwaukee, Wis.; National Petroleum News, Tulsa; National Supply Co., Tulsa; National Tank Co., Tulsa; National Transit Pump & Machine Co., Oil City, Pa.; National Tube Co., Pittsburgh, Pa.; New Bedford Cordage Co., New York; Norma Hoffman Bearings Corp., Stamford, Conn.; Norris, W. C., Manufacturing Co., Tulsa; North American Car Corp., Tulsa.

Oakite Products, Inc., New York; Walter O'Bannon Co., Tulsa; Oil Conservation Engineering Co., Cleveland, Ohio; Oil Country Specialties Manufacturing Co., Coffeyville, Kans.; Oil Engineering Co., Tulsa; Oil and Gas Journal, The, Tulsa; Oil Well Improvements Co., Tulsa; Oil Well Supply Co., Tulsa; Oklahoma Motor Co., Tulsa; Oklahoma Rig & Supply Co., Muskogee, Okla.; Oklahoma Steel Castings Co., Tulsa; Oster Williams Co., Cleveland, Ohio.

Packard Electric Co., Warren, Ohio; Palm Brothers Decalcomania Co., Chicago; Parker Appliance Co., Cleveland, Ohio; Parkersburg Rig & Reel Co., Parkersburg, W. Va.; Petroleum Electric Power Club, Oklahoma City, Okla.; Petroleum Engineer, Dallas, Tex.; Petroleum Engineering Co., Tulsa; Phillips Petroleum Co., Bartlesville, Okla.; Pittsburgh Equitable Meter Co., Pittsburgh, Pa.; Pittsburgh Steel Co., Pittsburgh, Pa.; Plibrico Jointless Fire Brick Co., Chicago; Podbielniak, Walter J., Tulsa; Powell, William, Co., Cincinnati, Ohio; Price, H. C., Inc., Bartlesville, Okla.; Price-Trawick, Inc., Stroul, Okla.; Progressive Brass Manufacturing Co., Tulsa; Purchasing Agents Association, Tulsa; Pyrene Manufacturing Co., Newark, N. J.

Reda Pump Co., Bartlesville, Okla.; Reed Roller Bit Co., Oklahoma City, Okla.; Refinery Supply Co., Tulsa; Republic Steel Corp., Youngstown, Ohio; Republic Supply Co., Houston, Tex.; Rickman, H., Tulsa; Ridge Tool Co., Elyria, Ohio; Ridgeway Dynamo Engine Co., Ridgeway, Pa.; Robinson Packer Co., Tulsa; Russell Manufacturing Co., Middletown, Conn.

Schramm, Inc., Westchester, Pa.; Scintilla Magneto Co., Sidney, N. Y.; Scoville Manufacturing Co., Waterbury, Conn.; Seismograph Service Corp., Tulsa; Service Station Equipment Co., Tulsa; Sherwin Williams Co., Tulsa; Sinclair-Prairie Oil Co., Tulsa; S.K.F. Industries, Inc., Philadelphia, Pa.; Skelly Oil

Co., Tulsa; Sludge Pumping Co., Inc., New York; Smith Separator Co., Tulsa; Sonner Burner Co., Winfield, Kans.; Spang, Chalfant & Co., Inc., New York; Spencer Trailer Co., Augusta, Kans.; Sperry Sun Well Surveying Co., Philadelphia, Pa.; St. Louis Surfacing & Paint Co., St. Louis, Mo.; Stitt Ignition Co., Columbus, Ohio; Sullivan Machinery Co., Chicago; Sun Oil Co., Philadelphia, Pa.; Sun Shipbuilding & Dry Dock Co., Philadelphia, Pa.; Surface Equipment Co., Tulsa.

Tagliabue, C. J., Manufacturing Co., Brooklyn, N. Y.; Taylor Instrument Co., Rochester, N. Y.; Templeton, Kenly & Co., Ltd., Chicago; Texas Co., Tulsa; Timken Michigan Co., Detroit, Mich.; Timken Roller Bearing Co., Canton, Ohio; Trimont Manufacturing Co., Roxbury, Mass.; Tube Turns, Inc., Louisville, Ky.; Tulsa Boiler & Machine Co., Tulsa; Tulsa Canvas Products Co., Tulsa; Tulsa Chamber of Commerce, Tulsa; Tulsa Public Library, Tulsa; Tulsa Rig, Reel & Manufacturing Co., Tulsa; Tulsa Rubber Products Co., Tulsa; Tulsa University, Tulsa; Twin Disc Clutch Co., Racine, Wis. Union Carbide Co., New York; Union Wire Rope Co., Tulsa; United American Bosch Corp., Springfield, Mass.; Universal Engineering Co., Los Angeles, Calif.; University of Oklahoma (School of Petroleum Engineering), University of Oklahoma (School of Geology); U. S. Bureau of Mines, Bartlesville, Okla.

Vapor Recovery Systems Co., Los Angeles, Calif.; Vellumoid Co., Worcester, Mass.; Victaulic Co. of America, New York; Viking Pump Co., Cedar Falls, Iowa; Vogt, Henry, Machine Co., Louisville, Ky.; Vol-U-Meter Co., Buffalo, N. Y.

Wackman Welded Ware Co., St. Louis, Mo.; Walworth Co., Boston, Mass.; Wallace Muller & Co., Ltd., New York; Waukesha Motor Co., Waukesha, Wis.; Webster Engineering Co., Tulsa; Wertzberger, D. D., Derrick Co., Tulsa; Westcott & Greis, Inc., Tulsa; Westcott Valve Co., E. St. Louis, Ill.; Western Pneumatic Co., San Antonio, Tex.; Westinghouse Electric & Manufacturing Co., E. Pittsburgh, Pa.; Wheeling Corrugating Co., Wheeling, W. Va.; White Co., The, Cleveland, Ohio; Wico Electric Co., Springfield, Mass.; Wiggins, John H., Co., Tulsa; Wilcox, H. F., Oil & Gas Co., Tulsa; Wilgus Manufacturing Co., Los Angeles, Calif.; Willard Storage Battery Co., Cleveland, Ohio; Williamette-Ersted Co., Portland, Ore.; Williams, J. H., Co., Buffalo, N. Y.; Wilson & Bennett Manufacturing Co., Chicago; Wilson Manufacturing Co., Wichita Falls, Tex.; Wilson Welders Co., New York; Worthington Machine Co., Tulsa.

Youngstown Sheet & Tube Co., Youngstown, Ohio.

Zero Hour Bomb Co., Tulsa; Zink, John, Co., Tulsa; Zipper Pulling Machine Co., Wichita, Kans.

Reservations received too late for assignment on this list included:

American Fork & Hoe Co., Cleveland, Ohio; Clover Manufacturing Co., Norwalk, Conn.; Lufkin Rule Co., Saginaw, Mich.; Master Lock Co., Milwaukee, Wis.; Nicholson File Co., Providence, R. I.; Crescent Tool Co., Jamestown, N. Y.; E. C. Atkins & Co., Indianapolis, Ind.; Hanry Disston & Sons, Erie, Pa.; Greenfield Tap & Die Co., Greenfield, Mass.; Spartan Saw Works, Springfield, Mass.; Wooster Brush Co., Wooster, Ohio; Yale & Towne Manufacturing Co., Stamford, Conn.

East Central Texas Fields

(Continued from Page 121)

top sand 3,640 feet, initial production 100 bbls. per hour through 1-inch tubing choke, total depth 3,655 feet. Island Oil Co.'s No. 4 Williams, top sand 3,635 feet, initial production 60 bbls. in one-half hour through open tubing, total depth 3,647 feet.

Magnolia Petroleum Co.'s No. 8-B Laird, top sand 3,562 feet, initial production 125 bbls. per hour through open tubing, total depth 3,577 feet. Quad Oil Corp.'s No. 5-A Duncan, top sand 3,636 feet, initial production 915 bbls. in five hours, total depth 3,647 feet. Shell Petroleum Corp.'s No. 18 W. W. Elder, top sand 3,556 feet, initial production 20 bbls. in one-quarter hour through open tubing, total depth 3,623 feet. Sinclair Prairie Oil Co.'s No. 17 S. G. Andrews, top sand 3,438 feet, initial production 30 bbls. in one-quarter hour through open tubing, total depth 3,475 feet. Texas Co.'s No. 17 H. T. Elder, top sand 3,642 feet, initial production 52 bbls. per hour through open tubing, total depth 3,661 feet. Tide Water Oil Co.'s No. 20 M. G. Barton, top sand 3,600 feet, initial production 11 bbls. in five minutes through open tubing, total depth 3,630 feet; No. 7 J. M. Blackman, top sand 3,627 feet, initial production 7½ bbls. in five minutes, total depth 3,635 feet. Trapshooter Reilly's No. 6 F. Mitchell, top sand 3,568 feet, initial production 37 bbls. in one-quarter hour through open tubing, total depth 3,612 feet. Wolf and Marine's No. 7 M. T. Cole, top sand 3,555 feet, initial production 60 bbls. per hour through open tubing, total depth 3,561 feet.

North Rusk County

Abercrombie and Harrison's No. 5 Cantrell, top sand 3,640 feet, initial production 100 bbls. in one-half hour through open tubing, total depth 3,665 feet. Empire Gas & Fuel Oil Co.'s No. 10 C. O. Christian, top sand 3,750 feet, initial production 27 bbls. in one-quarter hour through open tubing, total depth 3,764 feet; No. 11 H. P. Leverett, top sand 3,737 feet, initial production 28 bbls. in one-quarter hour through open tubing, total depth 3,737 feet; No. 12 H. P. Leverett, top sand 3,675 feet, initial production 32 bbls. in one-quarter hour through open tubing, total depth 3,724 feet. Hickman and others' No. 4 W. A. Hindman, top sand 3,620 feet, initial production 75 bbls. in one-half hour through open tubing, total depth 3,623 feet. Humble Oil & Refining Co.'s No. 4 Ben Peterson, top sand 3,520 feet, initial production 58 bbls. per hour through open tubing, total depth 3,590 feet; No. 5 Maggie Robinson, top sand 3,593 feet, initial production 90 bbls. per hour through open tubing, total depth 3,660 feet. Charles McMahon's No. 9 S. S. Laird, top sand 3,613 feet, initial production 90 bbls. per hour through open tubing, total depth 3,633 feet. W. B. Tucker's No. 5 D. Wills, top sand 3,642 feet, initial production 120 bbls. per hour through open tubing, total depth 3,651 feet.

South Rusk County

Edwards and Hall's No. 2 A. Thrash, top sand 3,660 feet, initial production 70 bbls. per hour through open tubing, total depth 3,730 feet. Gant-Garvin and Wegner's No. 2 Edwards, top sand 3,634 feet, initial production 34 bbls. per hour through open tubing, total depth 3,693 feet. W. B. Hamilton's No. 7 Gambrell, top sand 3,673 feet, initial production 85 bbls. per hour through open tubing, total depth 3,690 feet. Humble Oil & Refining Co.'s No. 5 E. S. Holt, top sand 3,780 feet, initial production 85 bbls. per hour through open tubing, total depth 3,817 feet; No. 38 W. L. Price, top sand 3,721 feet, initial production 75 bbls. per hour through open tubing, total depth 3,787 feet. Landrum and Prince's No. 2 Deason, top sand 3,649 feet, initial production 100 bbls. per hour through open tubing, total depth 3,659 feet. Octo Oil Co.'s No. 2 Deason, top sand 3,633 feet, initial production 80 bbls. in four hours, total depth 3,648 feet; No. 4 Giles, top sand 3,665 feet, initial production 75 bbls. per hour through open tubing, total depth 3,710 feet. Sinclair Prairie Oil Co.'s No. 48 W. D. Kinney, top sand 3,640 feet, initial production 31 bbls. in one-half hour through open tubing, total depth 3,655 feet; No. 52 Kinney, top sand 3,673 feet, initial production 32 bbls. in one-quarter hour through open tubing, total depth 3,685 feet; No. 16 Ledbetter, top sand 3,578 feet, initial production 21 bbls. in one-quarter hour through open tubing, total depth 3,623 feet; No. 18 Ledbetter, top sand 3,626 feet, initial production 20 bbls. in one-quarter hour through open tubing, total depth 3,652 feet. Slaughter and others' No. 2 W. H. Frederick, top sand 3,579 feet, initial production 230 bbls. in 24 hours flowing, total depth 3,640 feet.

Smith County

Alex McCutcheon's No. 1 J. R. Irion, top sand 3,760 feet, initial production 30 bbls. in 45 minutes through open tubing, total depth 3,763 feet. Magnolia Petroleum Co.'s No. 17 Wright, top sand 3,681 feet, initial production 25 bbls. in one-quarter hour through open tubing, total depth 3,687 feet. Sinclair Prairie Oil Co.'s No. 1-B Jarvis, top sand 3,697 feet, initial production 35 bbls. in one-quarter hour through open tubing, total depth 3,708 feet; No. 23-C Jarvis, top sand 3,666 feet, initial production 31 bbls. in one-quarter hour through open tubing, total depth 3,673 feet; No. 10 Wright, top sand 3,677 feet, initial production 30 bbls. in one-quarter hour through open tubing, total depth 3,689 feet. Summitt Drilling Co.'s No. 1 Mayfield Co., top sand 3,782 feet, initial production 15 bbls. per hour through open tubing, total depth 3,789 feet. Sun Oil Co.'s No. 4-A H. A. Pace, top sand 3,684 feet, initial production 41 bbls. in one-half hour through open tubing, total depth 3,689 feet.

Upshur County

E. & D. Oil Co.'s No. 5 Wills, top sand 3,672 feet, initial production 30 bbls. in one-half hour through open tubing, total depth 3,684 feet. General Crude Oil Co.'s No. 8 R. Williams, top sand 3,644 feet, initial production 18 bbls. in one-quarter hour through open tubing, total depth 3,649 feet. Glasscock's No. 4 Webb, top sand 3,700 feet, initial production 40 bbls. in one-quarter hour through open tubing, total depth 3,712 feet. Humble Oil & Refining Co.'s No. 24 Edwards, top sand 3,620 feet, initial production 62 bbls. through three-quarters inch tubing choke, total depth 3,662 feet. C. H. Lyons' No. 1 E. F. Johnson, top sand 3,595 feet, dry and abandoned, total depth 3,631 feet (C. H. Cooper Survey). B. F. Phillips' No. 1 Starr, top sand 3,630 feet, initial production 65 bbls. per hour through open tubing, total depth 3,634 feet.

WILDCAT COMPLETIONS

Limestone County

C. M. Joiner and others' No. 1 S. A. Knapp, top sand 970 feet, dry and abandoned, total depth 990 feet (Luke Moore Survey).

Morris County

Grover Hart's No. 1 Walcott and Lott, top Pecan Gap 2,580 feet, base 2,902 feet, elevation 258 feet, dry and abandoned, total depth 3,285 feet (D. A. Russell Survey).

Van Zandt County

Manning and Collin's No. 1 Mollie High, top Austin chalk 3,160 feet, base 3,445 feet, top Woodbine sand 4,178 feet, top Red Beds 4,202 feet, dry and abandoned, total depth 4,706 feet (William H. Bunch Survey).

Pure Oil Co.'s No. 4 B. W. Camper, initial production first 24 hours after choked for proration 80 bbls., total depth 2,968 feet.

Wildcat Operations in West Texas

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ECTOR COUNTY

Atlantic Oil & Prod. Co.'s No. 2 Holt, 660 ft. from N line and 1,980 ft. from E line of Sec. 19, Blk. A, P.S.L. Sur. ..... Location.

Continental Oil Co.'s No. 1 Holt, 660 ft. from W and 1,980 ft. from S line of Sec. 20, Blk. A, P.S.L. Sur. ..... T.D. 4,294 ft.; T.P. 4,266 ft.; shot with 180 qts. 4,250-94 ft.; flowed 20 bbls. per hour.

C. J. Davidson et al's No. 1 Cole, 660 ft. from N line and 660 ft. from W line of Sec. 10, Blk. 45, Twp. 1n, T.&P. Sur. ..... Rig up rotary

Harrison et al's No. 2 Addis, 990 ft. from N line and 2,200 ft. from W line of Sec 35, Blk. 43, Twp. 2s, T.&P. Sur. ..... Drlg. by tools; T.D. 3,836 ft.

Harrison et al's No. 3 Addis, 1,650 ft. from N line and 2,200 ft. from W line of Sec. 35, Blk. 43, Twp. 2s, T.&P. Sur. ..... Location.

Honolulu Oil Co. et al's No. 1 Kloh, 660 ft. from E and 1,980 ft. from S of Sec. 32, Blk. 44, Twp. 2s, T.&P. Sur. ..... Drlg. 765 ft.

Humble Oil & Ref. Co.'s No. 1 Thomas J. Martin, 330 ft. from N and 440 ft. from E line of Sec. 38, Blk. 42, T.&P. Sur. ..... Cleaning out to shoot; flowing aver. 35 bbls. of fluid, 3 per cent b.s. and water.

Humble Oil & Ref. Co.'s No. 2 E. J. Jones, 660 ft. from S line and 1,988 ft. from the W line of Sec. 6, Blk. 44, Twp. 3s, T.&P. Sur. ..... Prepare to spud.

Landreth Prod. Co.'s No. 2 O. B. Holt, 660 ft. from S and E lines of Sec. 15, Blk. 43, Twp. 1n, T.&P. Sur. ..... Rig up.

Landreth Prod. Co. and Llano Oil Co.'s No. 2 O. B. Holt, 1,980 ft. from W and 1,980 ft. from N, Sec. 20, Blk. A, P.S.L. Sur. ..... Drlg. 4,120 ft.

Landreth-Llano Oil Co.'s No. 3 Holt, 660 ft. from N line and 660 ft. from W line of Sec. 20, Blk. A, P.S.L. Sur. ..... Drlg. 3,300 ft.

McCurdy et al's No. 1 Foster, 330 ft. from S line and 440 ft. from W line of Sec. 36, Blk. 43, Twp. 2s, T.&P. Sur. ..... Drlg. 705 ft.

Moran Drlg. Co.'s No. 1 Smith, 330 ft. from N line, 330 ft. from W line of Sec. 12, Blk. 43, Twp. 1s, T.&P. Sur. ..... S.D. 4,425 ft.

Shell Pet. Corp.'s No. 2 Jones, 660 ft. from S line and 1,980 ft. from E line, Sec. 6, Blk. 44, Twp. 3s, T.&P. Sur. ..... Location.

Skelly Oil Co.'s No. 1 Addis, 990 ft. from N line, 2,200 ft. from E line of Sec. 35, Blk. 43, Twp. 2s, T.&P. Sur. ..... Water shut off: plugged back to 4,355 ft.; running tubing.

Stanolind O. & G. Co.'s No. 3 E. F. Cowden, 2,275½ ft. E and 330 ft. from S line, Sec. 26, Blk. 43, Twp. 2s, T.&P. Sur. ..... Drlg. 2,970 ft.

Stanolind Oil & Gas Co.'s No. 4 J. M. Cowden, 660 ft. from N and 1,980 ft. from E line of Sec. 27, Blk. 43, Twp. 1n, T.&P. Sur. ..... T.D. 4,321 ft.; plugged back to 4,268 ft.; shot 300 qts. 4,153-68 ft.; flowed 555 bbls. in 15 hrs.

Stanolind Oil & Gas Co.'s No. 5 J. M. Cowden, 660 ft. from N and 1,980 ft. from E line of Sec. 34, Blk. 43, Twp. 1n, T.&P. Sur. ..... Drlg. 4,140 ft.; hole full of oil.

Fred Turner, Jr.'s No. 1-C F. V. Addis, 1,650 ft. from the W line of Sec. 35, Blk. 43, Twp. 2s, T.&P. Sur. ..... Drlg. 3,876 ft.

Fred Turner's No. 2-A Addis, 2,310 ft. from N and 440 ft. from E of Sec. 35, Blk. 43, Twp. 2s, T.&P. Sur. ..... Cellar.

FISHER COUNTY

Condor Pet. Co.'s No. 1 Herring, 450 ft. from S and 330 ft. from W line of Sec. 192, Blk. 1, B.B.B.&C. Sur. ..... Rig up.

Condor Pet. Co.'s No. 2 Wilson, 640 ft. from N and 2,310 ft. from W line of Sec. 6, Blk. R, W. E. Richardson Sur. ..... Cellar.

Cranfill & Reynolds' No. 3 J. H. Young, 330 ft. W and 330 ft. S of NE cor. of survey, Sec. 208, B.B.B.&C. Sur. ..... Drlg. 2,915 ft.; show of oil 2,860-65 ft.

Merry Bros. and Perini's No. 1 J. J. Steele, 330 ft. E and 150 ft. N of SW cor. NE Sec. 210, B.B.B.&C. Sur. ..... Swabbed 500 bbls. in 24 hrs.; treated with acid; T.D. 3,190 ft.

E. L. Smith Oil Co.'s No. 1 fee, 450 ft. from S and 330 ft. from E, Sec. 202, Blk. 1, B.B.B.&C. Sur. ..... Drlg. 2,790 ft.
Roeser & Pendleton's No. 2 Frank Steele, 1,470 ft. from S and 990 ft. from W line of Sec. 210, Blk. 1, B.B.B.&C. Sur. ..... Drlg. 2,310 ft.
Sinclair Prairie Oil Co.'s No. 3 Frank Steele, 990 ft. from N and 330 ft. from E line of Sec. 72, Blk. 1, H.&T.C. Sur. ..... Drlg. 2,280 ft.
Stanolind Oil & Gas Co.'s No. 3 F. Steele, 660 ft. from S and 2,310 ft. from W line of Sec. 210, Blk. 1, B.B.B.&C. Sur. ..... S.D. 3,185 ft.
Stanolind Oil & Gas Co.'s No. 4 Steele, 1,170 ft. from S and 1,650 ft. from W line of Sec. 210, Blk. 1, B.B.B.&C. Sur. ..... Drlg. 2,580 ft.
Southern's No. 1 King, 660 ft. from N and 330 ft. from W line of SW Sec. 193, B.B.B.&C. Sur. ..... Drlg. 2,430 ft.
Texas Inland Oil & Gas Co.'s No. 1 First National Bank of Hamlin, 1,980 ft. from N and 990 ft. from W. Sec. 191, Blk. 1, B.B.B.&C. Sur. ..... Swabbed 94 bbls.; T.D. 3,107 ft.
Texas Co.'s No. 4 T. A. Jean, 920 ft. from N and E lines of Sec. 201, Blk. 1, B.B.B.&C. Sur. ..... Drlg. 2,580 ft.

GLASSCOCK COUNTY

Empire Gas & Fuel Co.'s No. 2 Hall, 330 ft. from N and W lines of Sec. 21, Blk. 33, Twp. 2s, T.&P. Sur. ..... Drlg. 1,700 ft.
John I. Moore et al's No. 1 J. S. McDowell, 1,980 ft. from N line and 660 ft. from E line of Sec. 22, Blk. 34, Twp. 2s, T.&P. Sur. ..... Bldg. derrick.

HOWARD COUNTY

L. C. Harrison et al's No. 2 Texas Land & Mortgage Co., 2,310 ft. from E line and 330 ft. from the S line of Sec. 4, Blk. 30, Twp. 1s, T.&P. Sur. ..... Location.
Humble Oil & Ref. Co.'s No. 2 Settles, 990 ft. from W and 330 ft. from S, Sec. 132, Blk. 29, W.&N.W. Sur. ... Prepare to deepen.
Merrick & Lamb's No. 11 Chalk, 2,310 ft. from N line and 990 ft. from W line of Sec. 135, Blk. 29, W.&N.W. Sur. ..... Drlg. 1,094 ft.
Permian Pacific Pet. Co.'s No. 1 Capps, 330 ft. from SW cor. of Sec. 17, Blk. 29, Twp. 1n, T.&P. Sur. ..... Location.
Joe Rusk et al's No. 2 G. M. Dodge Estate, 330 ft. from N line and 2,310 ft. from the E line of Sec. 9, Blk. 30, Twp. 2s, H.&T.C. Sur. ..... Swabbing 18 bbls. per day; T.D. 2,560 ft.; plugged back to 2,790 ft.
Joe Rusk et al's No. 3 G. M. Dodge, 330 ft. from the N line, 330 ft. from the E line, Sec. 9, Blk. 30, Twp. 1s, T.&P. Sur. ..... Location.
Schermerhorn Oil Co.'s No. 8 Kloh, 1,650 ft. from S and 330 ft. from W, Sec. 13, Blk. 33, Twp. 2s, T.&P. Sur. ..... Prepare to deepen; T.D. 2,294 ft.
Sinclair Prairie Oil Co.'s No. 1 Perry Jones, 2,310 ft. from W and 330 ft. from N, Sec. 9, Blk. 30, Twp. 1s, T.&P. Sur. ..... S.D. 818 ft.
Sinclair Prairie Oil Co.'s No. 10 Dodge, 2,310 ft. from S and 330 ft. from E, Sec. 1, Blk. 30, Twp. 1s, T.&P. Sur. ..... Drlg. 2,735 ft.; T.P. 2,465 ft.
Sinclair Prairie Oil Co.'s No. 12 Dodge, 330 ft. from S line and 2,360 ft. from W line, Sec. 11, Blk. 30, Twp. 1s, T.&P. Sur. ..... Location.
Sloan & Lewis' No. 1 Daniell, 2,475 ft. from E and 330 ft. from S of Sec. 18, Blk. 31, Twp. 1n, T.&P. Sur. ... Moving in material.
Southern Oil Co.'s No. 1 Denman, 2,310 ft. from N line and 330 ft. from W line of Sec. 10, Blk. 30, Twp. 1s, T.&P. Sur. ..... Fishing; T.D. 2,445 ft.
Sun Oil Co.'s No. 6 Phillips, 1,650 ft. from S and 330 ft. from E, Sec. 14, Blk. 33, Twp. 2s, T.&P. Sur. ..... Junked hole; skidded 50 ft. north.

IRION COUNTY

Williams-Short's No. 1 Gentry, 2,200 ft. from N line and 2,080 ft. from W line of Sec. 1, Blk. 3, H.&T.C. Sur... S.D. 835 ft.

JONES COUNTY

C. P. Campbell's No. 3 Herndon, 1,450 ft. from S line and 800 ft. from W line, Sec. 6, M.E.P.&P. Sur. ..... Cleaning out; T.D. 2,475 ft.
Clay & Lancaster's No. 2 Brewer, 700 ft. S and 150 ft. E of NW cor. of J. W. Martin Sur. ..... Rig up and S.D.
Elmer Close et al's No. 1 A. B. Faulks, 330 ft. from N line and 330 ft. from W line of Subdiv. No. 27, Henry Millard Sur. ..... S.D. 1,400 ft.
Condor Pet. Co.'s No. 2 Sayles, 650 ft. from N line and 960 ft. from W line of Sec. 3, Blk. 20, T.&P. Sur. ... Derrick.
C. C. Julian Rec.'s No. 4 Swan, 2,160 ft. from N line and 1,320 ft. from W line, I. Miley Sur. No. 281 .... Drlg. 2,000 ft.
Knight, Baker and Pardue's No. 1 A. W. Hill, 540 ft. from N line and 690 ft. from E line of Lot No. 1, Blk. 4, A. W. Hill Sur. ..... Drlg. 1,785 ft.
Southern Oil Corp.'s No. 2 Williams, 330 ft. from S and W line of Sec. 17, Blk. 19, T.&P. Sur. ..... Machine.

LOVING COUNTY

R. L. Allen's No. 2 fee, 4,290 ft. from NE line, 990 ft. from SE line, Sec. 82, Blk. 32, H.&T.C. Sur. ..... Location.
R. L. Allen's No. 3 fee, 4,290 ft. from NE line, 990 ft. from NW line, Sec. 82, Blk. 32, H.&T.C. Sur. ..... Location.
R. L. Allen's No. 4 fee, 4,290 ft. from NE line, 330 ft. from NW line, Sec. 82, Blk. 32, H.&T.C. Sur. ..... Location.
The California Oil Co.'s No. 8 Reagan-McElvain, 330 ft. from NW and SW lines of Sec. 84, Blk. 1, W.&N.W. Sur. ..... Moving in material.
Eppenauer Drlg. Co.'s No. 2-A Allen, 330 ft. from SE and 1,650 ft. from SW, Sec. 4, Blk. 2, W.&N.W. Sur... Flowed 162 bbls. of oil in 24 hrs. after shot; T.D. 4,305 ft.
Eppenauer Drlg. Co.'s No. 2 Hammill & Ellis, 410 ft. from NW and 796 ft. from NE lines of Sec. 2, Blk. 1, W.&N.W. Sur. ..... Material on ground.
William Little's No. 1 Richard & Dehle, 1,320 ft. from NE and 1,120 ft. from SE line of Sec. 92, Blk. 1, W.&N.W. Sur. ..... Drlg. 3,350 ft.
H. W. Martin's No. 4 Wheat, Ramsey, 990 ft. from SE and SW lines of Sec. 83, Blk. 1, W.&N.W. Sur. ..... Derrick.
Sinclair Prairie Oil Co.'s No. 2 Bell, 410 ft. from SE and 1,025 ft. from NE of Sec. 91, Blk. 1, W.&N.W. Sur. ..... Drlg. 835 ft. on new hole.
Texas Pacific Coal & Oil Co.'s No. 1 Carmine, C of SE of SW of Sec. 40, Blk. 54, Twp. 1, T.&P. Sur. ..... Drlg. 3,110 ft.

PECOS COUNTY

Mack T. Anderson's No. 1 McKenzie, 660 ft. from S line and 660 ft. from W line of Sec. 1, Blk. 604 ..... Location.
California Oil Co.'s No. 14 Mrs. M. A. Smith Lease No. 3, 2,028 ft. from the S line and 1,650 ft. from the E line of Sec. 35, Blk. 194, E.&T.C. Sur. ..... Waiting on cmt. to set; T.D. 1,206 ft.
Cardinal Oil Co.'s No. 17-E Tippett, 150 ft. from E line of W half and 720 ft. from N of No. 5-E, Sec. 40, Blk. 194, G.C.&S.F. Sur. ..... Waiting on cmt. to set; T.D. 481 ft.
Cardinal Oil Co.'s No. 18 J. H. Tippett, 850 ft. from N and 531 ft. from W of the SE cor. of the W half of Sec. 40, Blk. 194, G.C.&S.F. Sur. ..... T.P. 528 ft.; T.D. 540 ft.; plugged back to 535 ft.
Culberson Bros.'s No. 15-B Monroe, 725 ft. from N line and 1,380 ft. from E line of Sec. 39, Blk. 194, G.C.&S.F. Sur. ..... Location.
Humble Oil & Ref. Co. and Planning Pet. Co.'s No. 1 J. L. Nutt, 2,960 ft. from the N line and 890 ft. from the E line of Sec. 16, Blk. 125, T.&St.L. Sur. ... Drlg. 925 ft.
Humble Oil & Ref. Co.'s No. 1 White, Baker, 1,320 ft from N and E lines of Sec. 44, Blk. Z, T.C. Sur. ..... Drlg. 8,611 ft.
Mid-Kansas Oil & Gas Co.'s No. 18 Smith-Taylor, 1,296 ft. from S line, 1,390 ft. from W line, Sec. 33, Blk. 194, G.C.&S.F. Sur. ..... Location.
Mid-Kansas Oil & Gas Co.'s No. 24 Smith-Taylor, 250 ft. W of S half of Turner Tract No. 1, Sec. 33, Blk. 194, G.C.&S.F. Sur. ..... Road.
Mid-Kansas Oil & Gas Co.'s No. 8 Fred Turner, Jr., 263 ft. from N and 55 ft. E of N half of Tract No. 1, Fred Turner Sur. ..... Drlg. 1,316 ft.
Mid-Kansas Oil & Gas Co.'s No. 25 Smith-Taylor, 344 ft. W of SE cor. of S half of Turner Trace No. 1, Sec. 33 ..... S.D. 750 ft.
Mid-Kansas Oil & Gas Co.'s No. 26 Smith-Taylor, 395 ft. S and 344 ft. E of SE cor. of S half of Tract No. 1 ..... Cellar.
Mid-Kansas Oil & Gas Co.'s No. 1 Turner, 250 ft. from N line and 250 ft. from W line of Turner Sur. No. 3.. S.D. 590 ft.
Mid-Kansas Oil & Gas Co.'s No. 3 Fred Turner, 595 ft. from S line and 500 ft. from W line of Tract No. 2.. Drlg. 1,385 ft.
Mid-Kansas Oil & Gas Co.'s No. 8 Fred Turner, 204 ft. S and 55 ft. W of the most northerly NW cor. of L. G. Yates Sur. A-8,195, but in Fred Turner, Jr., Sur., Tract No. 1 ..... T.D. 500 ft.
Mid-Kansas Oil & Gas Co.'s No. 12-H Yates, 408 ft. S of N line of Sec. 32 and 344 ft. W of SE cor. of S half of Tract No. 1 ..... Location.
Mid-Kansas Oil & Gas Co.'s No. 13-H Yates, 408 ft. S of N line of Sec. 32 and 344 ft. E of SE cor. of S half of Tract No. 1 ..... Location.
Mid-Kansas Oil & Gas Co.'s No. 38-A Yates, 250 ft. E and 205 ft. S from the NE cor. of Turner Tract No. 3 in Sec. 34½, I. G. Yates Sur. ..... Location.
Mid-Kansas Oil & Gas Co.'s No. 39-A Yates, 150 ft. N and 250 ft. W of the NW cor. of Turner tract No. 4, in Sec. 34½, I. G. Yates Sur. ..... Cellar.
Mid-Kansas Oil & Gas Co.'s No. 40-A Yates, 344 ft. from E line and 395 ft. from N of SE cor. of S half of Turner Tract No. 1 ..... S.D. 680 ft.
Mid-Kansas Oil & Gas Co.'s No. 33-B Yates, 1,010 ft. from S line and 500 ft. from W line of Sec. 61, I.&G.N. Sur. ..... Drlg. 260 ft.
Mid-Kansas Oil & Gas Co.'s No. 34-B Yates, 1,088 ft. from N line and 498 ft. from W line of Sec. 61, I.&G.N. Sur. ..... Cellar.
Simms Pet. Co.'s No. 2 A. J. Devlin, 330 ft. from the N line and 330 ft. from the E line of the most easterly NE cor. of Sec. 2, John D. Duval Sur., Abst. No. 3,824 ..... Location.

REAGAN COUNTY

E. P. Kirschner and White's No. 1 W. A. White and McIntosh, 720 ft. from E and 800 ft. from N of Sec. 1,223, E.L.R.R. Sur. ..... S.D. 2,090 ft.

REEVES COUNTY

Grisham-Hunter Corp.'s No. 1 fee, 1,320 ft. from N line, 1,320 ft. from the E line of Sec. 10, Blk. 50, Twp. 8, T.&P. Sur. ..... Location.
Hugo Freels' No. 1 B. Greenman, 330 ft. from NE line and 231 ft. from SE line of Sec. 21, Blk. 2, H.&G.N. Sur. ..... Fishing for tools; T.D. 3,985 ft.
C. H. Lockhart et al's No. 1 W. D. Johnson, 330 ft. from N line and 330 ft. from W line of Sec. 3, Blk. C-13, P.S.L. Sur. ..... Location.

RUNNELS COUNTY

Agnew & Sons' No. 2 Fowler, 1,165 ft. from S and 150 ft. from W of NE cor. of Blk. 23, N. Travis Sur. .... Underreaming 1,850 ft.
Agnew and Currie's No. 1 H. E. Wade, 2,640 ft. from N line and 320 ft. from E line of Sec. 24, Domingo Diaz Sur. No. 532 ..... Digging cellar.
Anderson et al's No. 1 W. F. James, 330 ft. from N and W lines of Subdiv. No. 20, Norvell Travis Sur. .... Spudded and S.D.
Castor & Anderson et al's No. 1 W. F. James, 174 ft. from W line of Subd. No. 30, Norvell Travis Sur. No. 533 ..... Drlg. 820 ft.
L. L. Evans et al's No. 1 L. P. Woods, 330 ft. from SE line and 200 ft. from SW lines of section, T. Williams Sur. No. 529 (old hole being reworked) ..... Old T.D. 3,485-95 ft.; will treat with acid.
Golden Pet. Corp.'s No. 3 McMillan, 780 ft. from W and 330 ft. from N of Subdiv. No. 22, N. Travis Sur. No. 533 ..... Drlg. 2,280 ft.
Melrose Oil Co.'s No. 1 L. P. Woods, 150 ft. from NE lines and 3,475 ft. from W line of survey, Willett Holmes Sur. No. 100 ..... Rig up.
Rober.s Oil Corp.'s No. 1 J. L. King, 660 ft. from N line and 470 ft. from W line of most northerly King tract (old well being drilled deeper) ..... Standing with 2,500 ft. water in hole; old T.D. 3,730 ft.
W. S. Sawyer et al's No. 1 Giesecke, 1,211 ft. from N and 4,606 ft. from E lines of survey, Blk. 131, James Hughes Sur. ..... S.D. 1,110 ft.
Prairie Oil & Gas Co.'s No. 1 T. H. Wade, 2,597 ft. from N and 2,140 ft. from E line of Subdiv. No. 10, Norvel Travis Sur. ..... Drlg. 1,565 ft.
R. Tucker et al's No. 5 McMillan, 250 ft. from N and W lines of that part of Subd. No. 22 in the D. Diaz Sur. ..... Location.
Wahlenmaier Pet. Co.'s No. 1 T. C. Hall, 330 ft. out of SW cor. E.T.R.R. Sur. No. 149 ..... S.D. 2,617 ft. to plug; half full of water 2,390-2,400 ft.
F. D. Williams' No. 1 J. L. Elkins, 2,225 ft. from E and 1,300 ft. N of SW cor. of Blk. 12, but in Blk. 12, N. Travis Sur. No. 533 ..... Drlg. 1,400 ft.

SCHLEICHER COUNTY

H. E. Cooper et al's No. 1 Bert Page, 1,290 ft. from N line and 1,470 ft. from W line of Sec. 40, Blk. L, G.H.&S.A. Sur. (old well being drilled deeper) ..... Rig burned; T.D. 5,053 ft.

TERRELL COUNTY

H. H. Sides' No. 1 Phelps, 2,157 ft. from N line and 2,482 ft. from the W line of Sec. 5, Blk. 4-A, G. W. Turley Sur. ..... Fishing 5,600 ft.

UPTON COUNTY

Gulf Prod. Co.'s No. 103 McElroy, 1,980 ft. from S and 660 ft. from W, Sec. 197, Blk. F, C.C.S.D.&R.G.N.G. Sur. ..... Drlg. 9,408 ft.
Powell-Gap Oil Co.'s No. 1 J. F. Lane, 1,320 ft. from W line of Sec. 1, G.C.&S.F. Sur. ..... Drlg. 1,100 ft.
Texas Pacific Coal & Oil Co.'s No. 1-C J. H. Sherk, 1,650 ft. from S and 330 ft. from W, Sec. 1, Blk. 3-B, M.K.&T. Sur. ..... T.D. 1,525 ft.; plugged back to 1,100 ft.; bad hole.
Texas Pacific Coal & Oil Co. and Simms Pet. Co.'s No. 2 J. F. Lane, 990 ft. from the S line and 330 ft. from the W line of Sec. 36, Blk. 1, M.K.&T. Sur... Drlg. 2,345 ft.; 200 ft. of oil in hole; show of oil 2,275-2,315 ft.
Williams & Williams Drlg. Co.'s No. 1 Robbins, 1,600 ft. from S and 1,900 ft. from E, Sec. 4, G.C.&S.F. Sur.... S.D. 1,770 ft.

VAL VERDE COUNTY

South-Western Exploration Co.'s No. 1 E. K. Fawcett, 2,310 ft. from S and 2,310 ft. from E, Sec. 14, Blk. L, G.C.&S.F. Sur. ..... Moving in material.

WARD COUNTY

Alexander's No. 1 Richter, 1,650 ft. from NW, 1,170 ft. from NE line of Sec. 27, Blk. 33, H.&T.C. Sur. ..... Fishing for tools; T.D. 1,460 ft.
Atlantic Oil & Prod. Co.'s No. 10 Johnson, 990 ft. from NE line and 330 ft. from NW line of Sec. 9, Blk. 34, H.&T.C. Sur. ..... Drlg. 790 ft. on new hole.
Atlantic Oil & Prod. Co.'s No. 12 Johnson, 990 ft. from SE line and 990 ft. from NE line of Sec. 9, Blk. 34, H.&T.C. Sur. ..... Testing 2,504 ft.
Atlantic Oil & Prod. Co.'s No. 13 Johnson, 330 ft. from NE line and 330 ft. from SE line of Sec. 9, Blk. 34, H.&T.C. Sur. ..... Testing; T.D. 2,533 ft.
Atlantic Oil & Prod. Co.'s No. 15 Johnson, 330 ft. from SE line and 1,650 ft. from NE line of Sec. 9, Blk. 34, H.&T.C. Sur. ..... Drlg. 1,850 ft.

Barnsdall Oil Co.'s No. 3 Henry, Sec. 28, Blk. B-29, P.S.L. Sur. ..... S.D. 2,070 ft.
California Oil Co.'s No. 5 York, 1,650 ft. from S and 990 ft. from SW, Sec. 10, Blk. 34, H.&T.C. Sur. ..... Testing; T.D. 2,576 ft.
California Oil Co.'s No. 6 J. F. York, 2,310 ft. from the NW line and 990 ft. from the SW line of Sec. 10, Blk. 34, H.&T.C. Sur. ..... Fishing; T.D. 2,632 ft.
S. Caprito et al's No. 3 John B. Bennett, 330 ft. from the NE line and 330 ft. from the SE line of Sec. 16, Blk. 34, H.&T.C. Sur. ..... Drlg. 1,820 ft.
Gulf Prod. Co.'s No. 42 O'Brien, 2,310 ft. from N and 330 ft. from S, Sec. 17, Blk. F, G.M.M.B.&A. Sur. .... Drlg. 2,673 ft.
Gulf Prod. Co.'s No. 25 Hutchins, 1,650 ft. from N line and 330 ft. from W line of Sec. 4, Blk. F, G.M.M. B.&A. Sur. ..... T.P. 2,538 ft.; T.D. 2,612 ft.
Gulf Prod. Co.'s No. 26 Hutchins, 889 ft. from N line and 440 ft. from W line of Sec. 7, Blk. O, G.M.M. B.&A. Sur. ..... Drlg. 2,570 ft.
Gulf Prod. Co.'s No. 27 Hutchins, 2,310 ft. from N line and 330 ft. from W line of Sec. 4, Blk. F, G.M.M.B.&A. Sur. ..... Spudding.
Gulf Prod. Co.'s No. 43 O'Brien, 2,310 ft. from N line and 990 ft. from W line, Sec. 17, Blk. F, G.M.M. B.&A. Sur. ..... Drlg. 2,540 ft.
Gulf Prod. Co.'s No. 44 O'Brien, 2,310 ft. from N line, 330 ft. from W line of Sec. 17, Blk. F, G.M.M.B.&A. Sur. ..... Drlg. 975 ft.
Humble Oil & Ref. Co.'s No. 2 Louis Richter, 1,650 ft. from the NW line and 1,470 ft. from the SW line of Sec. 23, Blk. 34, H.&T.C. Sur. ..... S.D. 2,010 ft.
Jack Leidecker's No. 2 Archenhold, 2,310 ft. from NE and 2,310 ft. from SE, Sec. 23, Blk. 5, H.&T.C. Sur. .. Drlg. 2,785 ft.
Jack Leidecker et al's No. 1 Shell-Sloan, 990 ft. from NE and 330 ft. from NW of Sec. 15, Blk. 5, H.&T.C. Sur. ..... Drlg. 850 ft.
Simms Oil Co.'s No. 1 W. D. Johnson, 330 ft. from the NE and SE lines of Sec. 28, Blk. 34, H.&T.C. Sur. ... S.D. 2,580 ft.
Sinclair Prairie Oil Co.'s No. 4 Archenhold, 2,310 ft. from NW line and 2,310 ft. from SW line of Sec. 23, Blk. 5, H.&T.C. Sur. ..... Flowing 90 bbls. daily; T.D. 3,059 ft.
Sinclair Prairie Oil Co.'s No. 5 Archenhold, 2,310 ft. from SE and 2,310 ft. from SW of Sec. 23, Blk. 5, H.&T.C. Sur. ..... Material on ground.
Tex-Mex Pet. Corp. et al's No. 2 Liano-Sloan, 990 ft. from NW and 2,310 ft. from SW, Sec. 16, Blk. 5, H.&T.C. Sur. ..... Drlg. 2,480 ft.
Tex-Mex Pet. Corp.'s No.2-B Shell-Sloan, 2,310 ft. from NE and 990 ft. from NW, Sec. 16, Blk. 5, H.&T.C. Sur. ..... Cellar.
Tex-Mex Pet. Corp. et al's No. 2 Cal-Archenhold, 990 ft. from NE and 330 ft. from SE, Sec. 23, Blk. 5, H.&T.C. Sur. ..... Drlg. 1,600 ft.
Tex-Mex Oil Co.'s No. 3-B Shell-Sloan, 1,650 ft. from NE and 330 ft. from NW lines of Sec. 16, Blk. 5, H.&T.C. Sur. ..... Rig up.
S. A. Thompson et al's No. 7-A Johnson, 990 ft. from NW and 1,650 ft. from SW of Sec. 9, Blk. 34, H.&T.C. Sur. ..... Testing; T.D. 2,534 ft.

WINKLER COUNTY

Harry Adams' No. 2 Scarborough (old well being drilled deeper), 105 ft. from N and 1,000 ft. from E, Sec. 1, Blk. 77, P.S.L. Sur. ..... Drlg. 3,010 ft.
Colonial Oil Co.'s No. 4 Amerada-Scarborough, 990 ft. from N line and 990 ft. from E line of Sec. 18, Blk. 74, P.S.L. Sur. ..... Material on ground.
Magnolia Pet. Co.'s No. 4 Scarborough, 1,650 ft. from N line and 330 ft. from W line of Sec. 1, Blk. 77, P.S.L. Sur. ..... Cleaning out; T.D. 2,995 ft.
Magnolia Petroleum Co.'s No. 2 Walton, 330 ft. from N and 330 ft. from E, Sec. 19, Blk. 74, P.S.L. Sur. ..... S.D. 2,515 ft.
McCurdy & Easter's No. 1 Scarborough, 1,650 ft. from W and 2,310 ft. from S, Sec. 1, Blk. 77, P.S.L. Sur.... Rigging up and S.D.
Sid Richardson's No. 2-B Scarborough, 2,310 ft. from E line and 990 ft. from S line of Sec. 18, Blk. 74, P.S.L. Sur. ..... Fishing; T.D. 2,719 ft.
Sid Richardson's No. 5-A Scarborough, 330 ft. from W and 190 ft. from S, Sec. 1, Blk. 22-C, P.S.L. Sur. ..... Moving in machine.
Sid Richardson's No. 2-A State, Skelly, Scarborough, 102 ft. from N and 2,310 ft. E of NW cor. of Sec. 1, Blk. 77, P.S.L. Sur. ..... Prepare to shoot; T.D. 3,034 ft.
Sid Richardson's No. 1-B Tidal-Scarborough, 990 ft. from S line, 330 ft. from W line, Sec. 4, Blk. C-22, P.S.L. Sur. ..... Drlg. 1,430 ft.
Sinclair Prairie Oil Co.'s No. 1-C Scarborough, 2,310 ft. from W and 102½ ft. S of SE cor. Sec. 1, Blk. 22-C, P.S.L. Sur. ..... Drlg. 2,825 ft.

East Central Texas Wildcats

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GREGG COUNTY

George Carver's No. 1 R. M. Wood, 2,250 ft. from S line and 100 ft. from W line of survey, H. R. Hokit Sur. ..... Waiting on cmt. to set; T.D. 3,636 ft.
DeArman et al's No. 1 Register, 1,500 ft. from W line and 186 ft. from S line of survey, G. F. Penn Sur. ... Waiting on cmt. to set; T.D. 3,692 ft.
Elseep Oil Co.'s No. 1 G. S. Mattox, 3,460 ft. from N line and 1,200 ft. from W line of survey, D. Sanches Sur. ..... Derrick.
Gant-Garvin and Wegner's No. 1 J. W. Harris, 5,580 ft. from S line and 8,310 ft. from W line of survey .. Derrick.
George et al's No. 1 J. J. Lieck, 100 ft. from S line and 900 ft. from W line of survey, W. B. Witcher Sur. .. Rig up.
Halig Oil Co.'s No. 1 John Darley, 850 ft. from E line and 500 ft. from N line of survey, John Darley Sur. ..... Drlg. 1,600 ft.
Clyde H. Hall's (receiver) No. 1 North Chapel School, 1,180 ft. from W line and 100 ft. from N line of survey, M. Tennison Sur. ..... Bldg. derrick.
Idaho Oil Corp.'s No. 1 Dickson, 150 ft. from N line and 330 ft. from W line of 20-ac. lease, William Hester Sur. ..... Coring 3,536 ft.
Mid-Field Oil Co.'s No. 1 A. C. McCormick, 850 ft. from N line and 2,620 ft. from most easterly W line of survey, W. P. Chisum Sur. ..... Location.
Powderhorn Petroleum Co.'s No. 1 R. Stell, 6,300 ft. from W line and 100 ft. from N line of John Wilkerson Sur. ..... S.D. 1,100 ft.
Snowden et al's No. 1 J. T. Florence, 6,120 ft. from W line and 6,000 ft. from S line of M. V. Winkle Sur. ..... Drlg. 1,300 ft.
Sun Oil Co.'s No. 1 Cumi Wells, 330 ft. from W line, 1,800 ft. from S line of survey, M. Tennison Sur. .. Set surface csg.
Texas Gulf Prod. Co.'s No. 1 Register, 1,200 ft. from S line and 1,500 ft. from W line of survey, G. F. Penn Sur. ..... Derrick.
Webster Oil & Gas Co.'s No. 1 Register, 560 ft. from S line and 1,450 ft. from W line of survey, G. F. Penn Sur. ..... Drlg. 1,100 ft.

HENDERSON COUNTY

Roy Black et al's No. 1 C. B. Meredith, 380 ft. from N and W lines of 64.5 ac. tract, 4 miles SE of Malakoff, Wiley Kay Sur. ..... Location.
Campbell and Champlin's No. 1 R. S. Ansley, 108 varas S. 623 varas W of NE cor. of lease, 6 miles SE of Buffalo, N. H. Thompson Sur. ..... Derrick.
McGlothin et al's No. 1 A. J. Saylor, 330 ft. from W line and 517 ft. from N and S lines of 101-ac. lease, 3 miles NE of Murchison, Anderson Webb Sur... Derrick.
McElreath and Suggett's No. 1 C. D. Franklin, 330 ft. from N line and center of E and W lines of S 38 acres of C. D. Franklin 95-ac. tract, Stephen Hatton Sur. ..... Derrick.
Rector-Webb et al's No. 1 C. A. Riddlesperger, 225 ft. from S and W lines of 50-ac. lease out of 203-ac. tract, 10 miles SE of Malakoff, W. F. Mitcham Sur. ..... Rig up.

HUNT COUNTY

Meade and McKennie's No. 1 Love, 300 ft. from N line, 6,300 ft. from W line of 95-ac. tract, John Gillisky Sur. ..... Rig up.

KAUFMAN COUNTY

W. J. Lewis et al's No. 1 D. Clark, 430 ft. from S line and 600 ft. from E line of survey, 6½ miles NW of Elmo ..... Shut down.

LAMAR COUNTY

Cole et al's (formerly Optometrist Oil Club) No. 1 J. M. McFaddin, 450 ft. from S and W lines of E 25-ac. tract, 10 miles NW of Paris, Joseph Dick Sur. ..... S.D. 2,506 ft.

LEON COUNTY

Cooper et al's No. 1 W. E. Cozart, 1,000 ft. from SE cor. of 266-ac. tract in SW part of county, Thomas Gardner Sur. ..... Rig up and S.D.
Gholson Drlg. Co.'s No. 1 Alliance Trust Co., 330 ft. S and E of Humble's Alliance Trust Co., 3,000-ac. tract, Simon Sanches Sur. No. 9 ..... Location.
Shell Petroleum Corp.'s No. 1 Lee, 1,500 ft. from NW and SW lines of farm and survey, William Cooper Sur. ..... Reaming to make drill stem test; T.D. 5,673 ft.
Standard Oil Co. of Kansas' No. 1 A. W. Johnson, 466 ft. from NE line, 466 ft. from NW line of 100-ac. tract, Simon Sanches Sur. No. 7 ..... Location.
Tide Water Oil Co. and Texas Seaboard Oil Co.'s No. 1 G. W. Burkett, 8,500 ft. due S and 1,400 ft. from W at right angles from Magnolia Ferry, Simon Sanches Sur. No. A-23 ..... Bldg. road to location.

LIMESTONE COUNTY

C. M. Joiner et al's No. 1 S. A. Knobb, 900 ft. from N line and 1,000 ft. from W line of survey, one-half mile N of Falls County line, Luke Moore Sur. ..... Drlg. 1,700 ft.
J. Rodgers et al's No. 1 Vol DeLone, 1,516 ft. from W line and 600 ft. from N line of W 100-ac. tract, Pedro Varela Sur. ..... Shut down.

NAVARRO COUNTY

W. J. Keeling et al's No. 1 J. F. Rushing, 484 ft. from N line and 150 ft. from W line of 184-ac. tract, 6 miles SW of Richardson, Henry Ford Sur. ..... Location.
J. B. Stoddard et al's No. 1 C. S. West estate, 1,000 ft. from W line and 650 ft. from N line of 682-ac. tract, Mathew Boren Sur., Abstract No. A-56 ..... Rigging up.

RAINES COUNTY

J. W. Hallsell et al's No. 1 P. F. Jones, 400 ft. out of SW cor. of 22-ac. tract, 2½ miles S of Alba, B.B. B.&C. Sur. ..... Spudding.

RUSK COUNTY

Sam Cook et al's No. 1 W. H. Frederick, 450 ft. from N line and 5,600 ft. from W line of survey, Juan Ximenes Sur. ..... Derrick.
George Hudson et al's No. 3 Jeff Phillips, 150 ft. from N line of survey and 700 ft. from W line of 100-ac. tract, 4 miles SE of Minden, N. Villaria Sur. .... Drlg. 2,314 ft.
Imperator Oil Co.'s No. 1 G. W. Eaton, 208 ft. NW along most easterly N line of Gulf's G. G. Turner lease from most easterly NE cor. of same and 38 ft. NE at right angles, F. Cordova Sur. ..... Derrick.
J. H. Stewart's No. 1 fee, 50 ft. from N and E lines of NE cor. of G. W. Tutt Sur. ..... T.D. 3,300 ft. (no report).
L. I. Sugar's No. 1 Still, 8,210 ft. from W line and 1,175 ft. from N line of survey, John Wilkinson Sur. ..... Waiting on cmt. to set; T.D. 3,555 ft.

SMITH COUNTY

W. E. Farley et al's No. 1 Gant estate, 330 ft. N of Sinclair's Wiley lease, J. Jordan Sur. ..... Waiting on cmt. to set 3,775 ft.
Humble Oil & Refining Co.'s No. 1 H. C. Tucker, 2,030 ft. from N line and 700 ft. from E line of survey, J. Bell No. A-160 Sur., 3 miles SW of Friendship .. Location.

UPSHUR COUNTY

D. C. Fisher and Dye's No. 1 Starr, 700 ft. from N line and 700 ft. from W line of survey, Charles Cooper Sur. ..... Drlg. 3,300 ft.
Virgil Hodges et al's No. 1 J. M. Floyd, 330 ft. from NE cor. of 126-ac. tract, 4 miles N of Gladewater, Railroad Sur. ..... Derrick.

VAN ZANDT COUNTY

Gillum and Allen et al's No. 1 A. T. Bass, 150 ft. from W. line and 150 ft. from N line of 10-ac. tract, William Hart Sur. ..... S.D. 60 ft.
Griffith Bros.' No. 1 Bruce, 1,000 ft. from S line and 330 ft. from E line of 124-ac. tract, G. Martinez Sur. ..... S.D. 1,562 ft.
Humble O. & R. Co.'s No. 1 S. R. Ray, 200 ft. S, 160 ft. W of J. D. Listenbee 30-ac. lease in Nacogdoches County School Lands Sur. ..... Waiting on pumping equipment; T.D. 1,237 ft.
W. E. McKinney et al's No. 1 B. T. Davis, 210 ft. from N line and 160 ft. from W line of 139-ac. tract, J. Goodman Sur. ..... Testing 800 ft. of oil in hole; T.D 1,270 ft.
Pure Oil Co.'s No. 2 Ray, 250 ft. N of S line and 182 ft. W of E line of tract, Nacogdoches County School Land Sur, elev. 449.7 ft. ..... S.D. 1,215 ft.
Pure Oil Co.'s No. 4 R. C. Crim, 700 ft. N of S line, 241 ft. W of E line, Nacogdoches County School Land Sur. ..... Running tubing; T.D. 2,944 ft.
Pure Oil Co.'s No. 7 I. D. Miller, 150 ft. S of N line and 210 ft. W of E line of I. D. Miller 60-ac. tract, John Walling Sur. ..... Location.
Pure Oil Co.'s No. 16 R. L. Wells, 420 ft. W of E line and 500 ft. N of S line of R. L. Wells 26-ac. tract, H. V. Moore Sur. ..... Location.
Ray Drlg. Co.'s No. 1 J. W. Mallory, 1,150 ft. from S line, 150 ft. from W line of 217-ac. tract, John Walling Sur. ..... Derrick.

WOOD COUNTY

D. T. Cauble and Thompson's No. 1 N. G. Bobett, 650 ft. from S line and 220 ft. from W line of tract, 4½ miles NW of Mineola, Daniel Fuller Sur. ..... Fishing; T.D. 4,970 ft.
McElreath and Suggett's No. 1 B. D. Holley, 466 ft. from S and W lines of Holly tract, 8 miles SW of Winnsboro, James M. Moore Sur. ..... Location.

Wildcat Operations in Southwest Texas

(Continued from Page 120)

Howeth & Swiger's No. 1 Scott, 1,043 ft. from S line of Blk. 30 of Howeth & Swiger Subd., Molina Sur. ..... Derrick.
Hibert Jeanes' No. 1 G. L. Courtney, 1,600 ft. from E line, 330 ft. from S line of tract, G. A. Kerr Sur., 1½ miles NE of Pettus ..... Rigging up.

McLain et al's No. 2 Laura Weiss, B.&B. Sur., 660 ft. E of No. 1 ..... Drlg. 100 ft.
Phillips Pet. Co.'s No. 1 Morgan, 4,950 ft. from W, 3,270 ft. from N lines of 13,930-ac. tract, Eyles Sur. Spudding.

BELL COUNTY

Gus Winston et al's No. 3 Warrick, 100 ft. N of James Scroggins' No. 1 Warrick, in Elijah Ingram Sur. .. Drlg. 2,561 ft.; set 6⅝-in. csg. at 2,165 ft.

BEXAR COUNTY

A. M. Blume's No. 2 Louis Ridder, approximately 2,350 ft. N of R.R., 700 ft. E of W line of J. M. Baerera Sur. No. 58 ..... T.D. 1,030 ft.; W.O.C.
Keiffer et al's No. 1 Ruiz, SE cor. of 82-ac. tract in F. Rowland Sur. No. 48 ..... Drlg. 1,610 ft.
Dingman & Russell's No. 1 R. J. Coffey, 1,228 ft. from SE line, 1,086 ft. from SW line of 420-acre tract in Rodriguez Sur. ..... T.D. 1,034 ft.; to deepen.
S. E. Gantt's No. 1 A. B. Stephen, 2,650 ft. from SW line, 740 ft. from SE line of P. W. Hays Sur. .... T.D. 234 ft.; cleaning cavings.
Thos. Gorton's No. 1 Edward Jackel, 600 ft. from N line, 800 ft. from E line of tract in J. Ward Sur. .. T.D. 500 ft.; no report.
George L. O'Neill's No. 1 Neimann in Juan Montez Sur. No. 6 ..... T.D. 1,245 ft.; S.D. for orders.
J. W. Johnson's No. 1 Willow Springs, 150 ft. from N and W lines of lease in B. Munos Sur. No. 151..... T.D. 2,021 ft.; P.B. 1,940 ft.; S.D. Made SW and some oil.
Fred A. Perrenot's No. 1 Russell, 750 varas from NE line, 54 varas from NW line of 500-ac. tract in Rodriguez Sur. ..... T.D. 1,315 ft.; standing.
N. H. Price's No. 1 Barragas, 150 ft. from S and E lines of 60-ac. tract ..... T.D. 419 ft.; S.D.; to be comp. by H. E. Lewis.
N. S. Powell's No. 1 M. Sanner, 400 ft. from E line, 5,280 ft. from N line of 128-ac. tract in Ruiz Sur. No. 47 ..... Drlg. 610 ft.
C. A. Smith's No. 1 Henry Lamb, 750 ft. from N and E lines of Lamb farm, in de la Garza grant ..... Drlg. 955 ft.
A. A. Wietzel's No. 1 fee, F. Ricardo Sur. ..... Drlg. 975 ft. in shale.
C. Witherspoon's No. 1 Thos. Dillon, A. G. Mays Sur. ... Location.

BLANCO COUNTY

Rogers et al's (formerly Pedernales Pet. Corp.) No. 1 Lester, 550 ft. from N line, 6,100 ft. from W line of Antonio Bendrand Sur. ..... S.D. 1,215 ft.

BURLESON COUNTY

Brush & Hays' No. 1 C. W. Young, 150 ft. from SW line and 780 ft. from SE line of 140-ac. tract in Bird Sur. (7 mi. SE of Caldwell) ..... Drlg. shale 550 ft.

CALDWELL COUNTY

Adams & Lyles' No. 1 S. C. Cole, Tinney Sur. ..... Rigging up.
S. S. Cargill's No. 2 Damereau, 150 ft. from W line, 450 ft. from N line of D. Cooper Sur. ..... Drlg. 1,650 ft. in shale.
Simmons' No. 1 W. H. Callahan, 1,500 ft. from W and 750 ft. from S lines of 176.6-ac. tract, Miller Sur. (6½ miles SE of Lockhart) ..... Derrick.
Webster Oil & Gas Co.'s No. 1 Robinson, 770 ft. S and E from NW cor. of 100-ac. tract in John A. Neill Sur... Top Georgetown 2,200 ft.; coring for Edwards lime 2,280 ft.
Whitfield et al's No. 1 Wilms, 160 ft. from S line, 3,100 ft. from E line of 165-ac. tract in Cornelius Grenshaw Sur. ..... Top chalk 1,118 ft.; T.D. 1,625 ft.; abnd.

CALHOUN COUNTY

Keep Oil Co.'s No. 1 Patricia Welder, J. M. Rice Sur. .. Rigging up.

COMAL COUNTY

Theo. Hicks et al's No. 1 Gruene, 435 ft. from NE line, 414 ft. from NW line of H. Foster Sur. No. 34, 3 mi. NE from New Braunfels ..... Spudded and standing.

DEWITT COUNTY

Humble O. & R. Co.'s No. 1 Kuester, 4,100 ft. from N line, 466 ft. from E line of lease in S.A.&M.G. R.R. Sur. No. 7 ..... D.S. test 3,835-42 ft.; showed 1,100 ft. salt water 10 min.; D.S.T. 3,870-84 ft.; tested 7 thribbles salt water; drlg. shale 4,305 ft.
Keystone Royalties' No. 1 L. T. Burns, 1,000 ft. from N and W lines of 265-ac. tract in McNutt Sur., Blk. 22 ..... Location.

DUVAL COUNTY

Birdwell Oil Co.'s No. 1, Southerland Sur. No. 212 .... Drlg. 2,075 ft.
Cecil Best's No. 1 Parr, 1,320 ft. from SE line and 990 ft. from NE line of Sur. 134 (10 miles W and 2 miles N of San Diego) ..... Rigging up.
Buffalo-Texas Drlg. Synd., Inc.'s No. 1 Escobar, 700 varas from W line, 1,000 varas from N line of 920-ac. tract in Francisco grant ..... Drlg. 725 ft.
Chiquita Oil Co.'s No. 1 Richardson, 330 ft. from N and E lines of Sec. 5 ..... Moving in.
Clark & Cowden's No. 2 J. M. Richardson, 417 ft. from N line and 261 ft. from W line of Blk. No. 1, Sec. 3.. Drlg. 50 ft.
Continental Oil Co.'s No. 1 R. Driscoll Est., 130 ft. from S, 1,370 ft. from E lines of lease, Sec. 448 .. Drlg. 702 ft.
Humble O. & R. Co.'s No. 1-B Peters, 1,320 ft. from N line, 330 ft. from W line of Sur. No. 15 ..... T.D. 2,889 ft.; abnd.
Magnolia Pet. Co.'s No. 2 Tankersley, 330 ft. from N and E lines of SW SW Sur. No. 46 ..... Location.
C. G. Mortimer's No. 1 W. R. Peters, 330 ft. from S line, 990 ft. from W line of NE Sur. No. 176 ..... Drlg. shale 310 ft.
A. H. Richardson et al's No. 1 Drummond, 660 ft. from N and W lines of Sur. No. 392 (north central part of county) ..... Location.
Windsor Oil Co.'s No. 1 B. Peters, 100 ft. from S and 2,209 ft. from E lines of Sur. 34 ..... Derrick.
Witherspoon et al's No. 1, Richardson Sur. No. 5 ..... Rigging up.
Louis Yeager's No. 1 fee ..... Sand 865-75 ft.; unable to make test; drlg. 888 ft. in shale.
Louis Yeager's No. 1 Yeager, 694 ft. from W line, 1,527 ft. from S line of Sur. No. 38 ..... T.D. 865 ft.; testing.

EDWARDS COUNTY

Love and Evans' No. 1 Steve Brown, 660 ft. from N and E lines of Sec. 66, G.W.T.&P.R.R. Sur., 15 miles W of Rock Springs ..... T.D. 3,002 ft.; moving in heavy rig for 7,000-ft. test.

FRIO COUNTY

Amerada Pet. Corp.'s No. 1 Frank Doering, 34 ft. from W line, 1,700 ft. from S line of Tract No. 7 in Marcia Louisa Carranza Sur. No. 302 ..... T.D. 6,507 ft.; treated with 1,000 gals. acid; flowing 17 bbls. fluid per hour, ½ bbl. oil and 5,000,000 ft. gas daily.
Humble O. & R. Co.'s No. 1 Woodward, 3,200 ft. from NE line, 1,200 ft. from SE line of 830-ac. tract in E. Poor Sur. ..... T.D. 1,800 ft.; shale; fishing.

GILLESPIE COUNTY

Powers et al's No. 2 Lindig, 12,700 ft. from S line, 1,333 ft. from W line of Maria Josephine Guerrera Sur. ..... Location.

GUADALUPE COUNTY

A. F. Barnhill's No. 3 F. A. Phullman, 1,300 ft. from N line, 152 ft. from E line of lease in L. Bollinger Sur. ..... Top Edwards 2,402 ft.; S.D. 2,446 ft.
Adolph Seideman's No. 1 Seideman, 280 ft. from NE line, 470 ft. from NW line of Mrs. Adolph Seideman 147.5-ac. tract (Subd. 110) in Antonio Maria Esnaurrizer Sur. No. 11 ..... T.D. 2,524 ft.; abd. in Nov., 1930, as the New Braunfels O. & G. Co.'s No. 1 Seideman; fsg.
J. E. Clark et al's No. 1 Howell, 1,500 ft. S of road and 200 ft. from E line of tract ..... Location.
M. W. Eiser's No. 2 Wells, 1,700 ft. from S line, 200 ft. from W line of Blk. 3, Subd. 1, J. de la Baume Sur. ..... Location.
Trinity Drillers' No. 1 Ball, 330 ft. from NE and SE lines of 91-ac. tract in L. H. Peters Sur ..... Location.
L. E. Trout's No. 1 McKee, Green DeWitt Sur. ..... Rigging up.

HAYS COUNTY

J. C. Crowder's No. 1 Burnett, 2,370 ft. from E line, 1,400 ft. from N line of tract in J. Ingram Sur. .... T.D. 430 ft.; set csg.; S.D.

HIDALGO COUNTY

D. D. Oil Co.'s No. 1 Mrs. L. George, 330 ft. from N and W lines of 40-ac. tract in Share 13, Porcion 41.. Location.
Union Sulphur Co.'s No. 1 American Rio Grande L. & I. Co., 400 ft. S and W of NE cor. of Lot 229, Blk. 59 (½ mi. N of Mercedes) ..... Set 13-in. csg. at 1,134 ft.; drlg. 1,150 ft.
Weekley Oil Corp.'s No. 1 Guerra, Porcion 41 ..... T.D. 3,102 ft.; abnd.

JIM HOGG COUNTY

French Oil Co.'s No. 1 Gutierrez, 330 ft. from N line, 330 ft. from W line, Blk. 1, in Sur. No. 142, E from Alworth Pool ..... T.D. 2,503 ft.; abnd.
A. W. Majors' No. 1 M. Guerra & Son, 2,444 ft. from W line, 3,698 ft. from N line of Sur. No. 369, in SW part of county ..... Drlg. 2,205 ft.

JIM WELLS COUNTY

Plymouth Oil Co.'s No. 1 Cuero Cattle Co., 330 ft. from S and W lines of H.T.&B. Sur. No. 7, 2½ miles W from Alfred ..... Rigging up.
Putnam and Bode's No. 1 McCarley, 600 ft. from SE line and 1,500 ft. from NE line of 300-ac. tract, Blk. A, of W. H. Bode Subdivision of Wallace D. Wade Ranch ..... Derrick.
C. H. Robertson's No. 1 C. Muil, 330 ft. N of N end of division line between Lots 4-A and 5-A of Seefelds farm lots, or 1,300 ft. from W line, 300 ft. from N line of Pointevant Sur. No. 205 ..... Heatly magnetometer location; S.D. 403 ft.

KARNES COUNTY

Campbell et al's No. 1 Ira Coats, 340 ft. from S and E lines of 260-ac. tract in Carlos Martinez Sur. .... D.S. test 2,551-68 ft.; made 7 thribbles salt wtr. 10 min.; T.D. 2,620 ft.; S.D.
Magnolia Pet. Co.'s No. 1 Scarborough, Ella Talley Sur., 330 ft. S and E from NW cor. of tract ..... Top Pettus sand 3,620 ft.; T.D. 3,639 ft.; S.D.; D.S. test 3,606-27 ft.; tested 274 bbls. on one-quarter in. choke on bottom and five-sixteenths in. choke on top with 5 ft. mud, no oil, 6 min.; drilled plugs; to comp. for gas well.
George Ray's No. 1 Radford, 666 ft. from SW and 3,422 ft. from SE lines of 753-ac. tract in Nichols Sur. (4 miles NE of North Pettus Field) ..... Rigging up.
C. J. Webster's No. 1 J. B. Cannon, 1,140 ft. from N line, 250 ft. from E line of 80-ac. tract in Lambrano Sur. ..... T.D. 1,790 ft.; standing; may deepen to Yegua.

KENDALL COUNTY

Martin's No. 1 Houston, Thomas Leople Sur. No. 761 .... Top black shale 1,028 ft.; T.D. 1,985 ft.; to deepen.
A. P. Pierce's No. 1 Werner, in SW cor. of 40-ac. tract, 150 ft. from S and W lines of J. F. Torrey Sur. .... T.D. 992 ft.; standing.
W. E. Waldrip's No. 1 Charles Meckel, 300 ft. from E line, 8,300 ft. from S line of Thos. J. Sweeney Sur. No. 10 ..... S.D. 515 ft.

KERR COUNTY

G. F. Schreiner's No. 3 Love, 1,420 ft. from W line, 1,260 ft. from S line of Sur. No. 1,594 ..... Location.
Van Duyn & Moore's No. 1 Nowlin, 2,000 ft. from E line, 2,200 ft. from N line of Jas. R. Bettner Sur. No. 99 ..... T.D. 1,040 ft.; standing.

KLEBERG COUNTY

J. S. Brown's No. 1 Antone Dietz, Sec. 7, Hotch estate .. Drlg. sticky shale 1,400 ft.
Harry Clark's No. 1 V. J. Kivlin, 360 ft. from E line, 400 ft. from S line of Sec. 39, Blk. 8, Kleberg Town & Improvement Co. Sur. ..... T.D. 2,350 ft.; reaming; S.O. 2,315-16 ft.

LASALLE COUNTY

G. O. Ball's No. 1 J. M. Martin, 330 ft. from S and W lines of Martin 485.6-ac. tract, Sur. 683 ..... Moving in.

LEE COUNTY

Blackmar et al's No. 1 Beaty, William Nichols Sur. .... Location.
H. A. Sherlack's No. 1 Otto, 736 ft. from NW line, 1,310 ft. from NE line of 57.5-ac. tract in Thomas Morrow Sur. ..... Rig up and S.D.

LIVE OAK COUNTY

Marine Oil Corp.'s No. 1 J. B. Dunning, 4,500 ft. from E line, 150 ft. from N line of 462-ac. tract in Maria Bridget Kiolin Sur. ..... Sand 5,226-62 ft.; S.D.
Witherspoon Oil Co.'s No. 1 Clementa, Elizabeth Jordan Sur., Blk. 15, 600 ft. from S line and 600 ft. from W line of 162-ac. tract ..... Drlg. 75 ft.

McMULLEN COUNTY

Bedwell's No. 1 Brown, Sur. No. 54 ..... Drlg. 771 ft.
Cotulla's No. 1 Gordon, 330 ft. from N and W lines of S½ of Sec. 127 ..... Moving in.
Magnolia Pet. Co.'s No. 1 Kincaid, 8,800 ft. N of Nueces River and 466 ft. E of Sur. No. 199 ..... Drlg. 2,519 ft.
LeFevre & Spice's No. 2 Hagist, 2,970 ft. from E line and 1,650 ft. from S line of Sec. 17, Blk. 5, H.&T.C. Sur. ..... Location.
C. C. Shumway's No. 4 Shiner, 330 ft. from W line, 660 ft. from N line of SE Sec. 38, Shumway's Subd., Shiner ranch ..... Drlg. 1,606 ft.
Ike Taylor's No. 1 Wolfe, 330 ft. from N line and 330 ft. from E line of Sec. 81 ..... Location.

MEDINA COUNTY

Humble O. & R. Co.'s No. 1 J. D. Dodson, 330 ft. from N and 660 ft. from W line of A. Kempf Sur. ..... Drlg. 1,630 ft.
Scoggin & Sanders' No. 1 L. W. Burell, 150 ft. from E line, 1,750 ft. from N line of M. E. Gage Sur. No. 395 ..... T.D. 425 ft.; S.D.

MILAM COUNTY

O. H. Birdwell's No. 1 J. R. Bartek, 150 ft. from N line, 180 ft. from W line of 88-ac. tract in J. A. de Pena Sur. ..... S.D. 1,510 ft.
Marvel Wells' No. 1 fee, J. Liendo Sur. ..... Top Austin 1,445 ft.; top Georgetown 2,175 ft.; drlg. 2,300 ft.

NUECES COUNTY

Clymore Oil Co.'s No. 1 Ingram, 660 ft. from N and E lines of Blk. No. 5, Sec. 6 ..... T.D. 650 ft.; set csg.
Diadem Oil Co.'s No. 1 J. C. Mayo, 1,000 ft. along line from SE cor. in NW direction, thence due N 300 ft. (near Robstown), Sec. 23 ..... Derrick.
Nuco Oil Co.'s No. 1 Synthia Bluntzer, Herrera Sur., 2,240 ft. from S line, 330 ft. from W line of 639.27-ac. tract ..... Drlg. 600 ft.
Sullivan and Texon Royalty Co.'s No. 1 Simmons & Perry, 330 ft. from S and W lines of NE of square 640-ac. section out of SW cor. of Simmons & Perry tract, 2 miles east of Agua Dulce Field ..... Drlg. 4,051 ft.

SAN PATRICIO COUNTY

Atkins & O'Neil's No. 1 Welder, 7,898 ft. from E and 317 ft. from S lines of Juan Hart & Sons and John Lucas Sur. (2 miles W of Angelita) ..... Show gas 1,090 ft.; drlg. 3,150 ft.; cored dry sand 2,770 ft.
C. B. Bunte's No. 1 J. D. Holland, Sec. 26 of Eaton's Subd., 660 ft. from E and 1,320 ft. from N lines of lease (2 mi. SW of Sinton) ..... Drlg. 1,776 ft.
Carpenter et al's No. 1 Sadler, 300 ft. each way out of SE cor. Blk. 1, Sec. 32, T. Peres Sur. ..... R.U.

DeLange et al's No. 1 Sevier, 150 ft. N of S line, 7,650 ft. E of most southerly W line of Clara Driskol, Sevier, 7,045-ac. tract in Antonio Ramirez Sur., N of Premont area ..... 1,450 ft.; no report.

Diadem Oil Co.'s No. 1 J. C. Mayo, 300 ft. from S and 1,000 ft. from E line of Sec. 25, George H. Powell Subd. of the Driscoll ranch (S of Robstown) ..... Location.

Plymouth Oil Co.'s No. 1 Welder, 4,700 ft. N of Chiltipin Creek, 900 ft. from W line of J. M. and F. Portilla Sur., 1⅛ miles N from Sinton ..... Top Discorbis 4,100 ft.; drlg. 5,410 ft.; no showings.

STARR COUNTY

Chas. H. Andrews et al's No. 1 A. Guerra, San Jose grant, 330 ft. from N and 150 ft. from E line of Sec. 6 (NE part of county) ..... Spudding.

B. & B. Oil Co.'s No. 2 Kelsey Bass, 330 ft. from W and S lines of Blk. 12 of Subd. of Porcions 86 and 87, jurisdiction Camargo ..... Rigged up and S.D.

Dean Bros.' No. 1 M. M. Garcia, 2,150 ft. from S line, 4,600 ft. from W line of Sur. No. 916 ..... Location.

Goodwin & Yantis' No. 5 Kelsey Bass, 150 ft. from S and W lines of Blk. 1, Sur. 3, of Coastal O. & G. Co.'s Subd. of Porcion 86, jurisdiction Camargo .... T.D. 690 ft.; est. 15,000,000 to 20,000,000 ft. gas, 700 lbs. pressure.

Goodwin-Yantis' No. 4-A Kelsey Bass, 1,300 ft. NW of No. 3 in Porcions 86 and 87, Ancient Jurisdiction of Camargo ..... Location.

Great Plains Oil Co.'s No. 1 Sanches, 660 ft. from W line, 330 ft. from S line of SE NW of Sur. No. 344 .. T.D. 3,517 ft.; preparing to resume drilling.

Jeffries-Lambeth Drlg. Co.'s No. 2 Starr County Cattle Co., N of No. 1 in Share 60, Porcion 89 ..... T.D. 2,519 ft.; sand 2,505-18 ft.; comp.; no gauge.

W. H. Liber's No. 1 I. Y. Garcia, 1,546 ft. from N line, 962 ft. from W line of 254-ac. tract in Porcion No. 75, jurisdiction of Camargo ..... Drlg. 1,040 ft.

Milhoon Drilling Co.'s No. 1 Rogan, 150 ft. from NW and NE lines of SE 468 acres of Sur. 6, El Javali grant ..... T.D. 1,622 ft.; abnd.

Myers, Sullivan & Jenkins' No. 1 Starr County Cattle Co., 330 ft. from N line, 330 ft. from W line, Blk. 62, Porcion 89, Share 60 ..... T.D. 2,520 ft.; preparing to start up.

R. D. Perkins & Hoffman's No. 1 E. A. Peffler, 3,090 ft. from W line, 2,480 ft. from S line of Sur. 933 ... T.D. 1,547 ft.; S.D.

TRAVIS COUNTY

Franklin et al's No. 1-A Reimers, 1,200 ft. from SE line, 1,600 ft. from most southerly SW line of Sur. No. 35 ..... T.D. 933 ft.; abnd.

G. M. Rowe's No. 2 Smith (200-ac. tract), 450 ft. from NE and SE lines of tract in L. Kimbro Sur. ..... T.D. 822 ft.; abnd.

UVALDE COUNTY

Evans & Johnson's No. 1 Farris, J Hammons Sur. ..... Drlg. shale 510 ft.

WEBB COUNTY

L. E. Lockhart's No. 1 E. Eikel, 330 ft. from N line, 240 ft. from E line of Sur. No. 1,672 ..... Rigging up.

Don E. Megahan et al's No. 1 F. C. Gowdy, 330 ft. from E line, 1,450 ft. from N line of Sur. No. 2,112.. Drlg. 2,452 ft.

Shankel et al's No. 1 Saldivar, Sur. 652 of J. V. Borrego grant ..... Location.

Weekley Oil Corp.'s No. 1 R. Salvidor, 1,269 ft. from E line and 243 ft. from N line of Sec. 657, Borrego grant (SE part of county) ..... Rigging up.

WILSON COUNTY

Bidnar & Powell's No. 1 L. C. George, 400 ft. from SE line, 475 ft. from SW line of 86.5-ac. tract in C. Dias Sur. No. 44 ..... T.D. 1,326 ft.; S.D.

Pfiel & Vogel's No. 1 Gutzeit, Flores grant, 150 ft. N of road and 150 ft. from W line of farm, 7 mi. NW of Floresville ..... T.D. 100 ft.; S.D.

J. C. Yancey's No. 1 Lissy, D. J. Holt Sur., 1,700 ft. from SE and 6,500 ft. from most westerly SW cor. of survey ..... Spudded and S.D.

WILLIAMSON COUNTY

Atlantic-Pacific Corp.'s No. 1 W. C. Daniel, 500 ft. from SW line, 2,100 ft. from SE line of Washington P. Reese Sur. No. 3 ..... T.D. 401 ft.; S.D.

McLean et al's No. 2 R. C. Miller, 800 ft. to S line, 100 ft. to W line of tract, B. Manlove Sur. ..... T.D. 2,300 ft.; U.R. 2,297 ft.

Taylor Ref. Co.'s No. 2 L. Bachmeyer, 150 ft. from W line of 38-ac. tract in H. White Sur. (6.5 miles SE of Taylor) ..... T.D. 861 ft.; comp. 15 bbls. per day.

Taylor Ref. Co.'s No. 1 Zeischang, H. White Sur. ..... T.D. 1,100 ft.; abnd.

R. S. Wilson's No. 2 Sing, 300 ft. from SW line, 1,250 ft. from SE line of T. A. Moore Sur. ..... T.D. 530 ft.; washing.

ZAPATA COUNTY

O. W. Killam's No. 7 Bruni, Blk. 53, O. W. Killam Subd. of Share Z-8 of Blas Uribe tract in San Ignacio Subd. of J. V. Borrego grant ..... T.D. 1,829 ft.; W.O.C.

Muckelroy's No. 1 Flores, on NE line and 75 ft. from SE line of Lot 2, Blk. 30, Muckelroy Subd. of Porcion No. 37 ..... Derrick.

Southwest Texas Proven Areas

Week Ending March 24

CEDAR CREEK POOL—BASTROP COUNTY

Cole Petroleum Co.'s No. 4 American National Bank, 150 ft. from SE line, 1,650 ft. from SW line of Lucy Hendrix 610-ac. tract in R. Gage Sur. No. 10.. T.D. 1,678 ft.; top Serp.; S.O. 1,671 ft.; 6⅝-in. csg. at 1,615 ft.; comp. 300 bbls. dly.

Marts & Bevins' No. 3 Orgain, Addison Litton Sur. .... Location.

NORTH DALE POOL—BASTROP COUNTY

Chiquita Oil Co.'s No. 1 A. H. Hanna, Joshua Gray Sur. ..... Top lime 2,198 ft.; Serp. 2,242-86 ft.; washing to bottom to set csg and test; T.D. 2,330 ft.

Marts & Bevins' No. 4-A C. L. Riddle, John Maxmilian Sur. ..... Drlg. 2,180 ft. in hard sand.

Ogden & Reed Oil Co.'s No. 1-A C. L. Riddle, John Maxmilian Sur. ..... Derrick.

Ogden & Reed's No. 6 Spradlin, Joshua Gray Sur. ..... T.D. 2,347 ft.; D.S. test 2,313-31 ft. mud with showing of oil and gas; comp. 275 bbls. dly., pumping and flowing.

Watt L. Saunders' No. 1 Harris, 1,100 ft. from SW line, 2,830 ft. from NW line of John Maximilian Sur. No. 22 ..... Drlg. 1,420 ft. in shale.

Witherspoon Oil Co.'s No. 1 A. H. Harris, 150 ft. from SE and SW lines of Harris 180-ac. tract in Joshua Gray Sur. ..... Spudded in.

ECKERT POOL—BEXAR COUNTY

Alamo Nat. Gas Co.'s No. 2 Coreth, 300 ft. SE of Humble's No. 2 Coreth in A. Stafford Sur. ..... T.D. 1,055 ft.; set 6⅝-in. csg.; S.D.

J. F. Harrison's No. 4 F. Gembler, 150 ft. from NW line, 460 ft. from NE line of 88-ac. tract in J. Montez Sur. ..... T.D. 831 ft.; S.D.

S. J. Moore's No. 5 T. W. Masterson, 150 ft. from S line, 175 ft. from W line of 41-ac. tract in Miguel Gortaris Sur. ..... T.D. 736 ft.; 6 1/5-in. csg.

S. J. Moore's No. 4 T. W. Masterson, 150 ft. from S and W lines of tract in M. Cartari Sur. ..... T.D. 330 ft.; S.D.

VON ORMY POOL—BEXAR COUNTY

Von Ormy Oil Co.'s No. 2 E. B. Carruth, 515 ft. from W line, 1,970 ft. from S line of 160-ac. tract out of 657-ac. tract in F. Rolen Sur. ..... Rigged up and standing; to be drilled by Cosby & Flowers.

SLICK POOL—DEWITT COUNTY

Slick-Seeligson Corp.'s No. 3 Poetter, 2,340 ft. from SW line and 1,320 ft. from SE line of lease on 591-ac. tract in Marshall County ..... Location.

EAGLE HILL POOL—DUVAL COUNTY

Al Buchanan's No. 5 Duval County Ranch Co., 990 ft. from E line, 330 ft. from S line of N½ of Sur. No. 206 ..... T.D. 101 ft.; S.D.

Al Buchanan's No. 4 Duval County Ranch Co., 990 ft. from S line, 2,310 ft. from E line of N½ Sur. 206.. T.D. 100 ft.; standing.

R. D. Kelley's (S.R.C.) No. 5 Foster, 330 ft. from S and W lines of 50-ac. tract in Sur. No. 206 ..... Sand 2,151 ft.; tested S.W.; P.B. 2,146 ft.; comp. 2 bbls. hr. approx.; 40 per cent salt water through ¾-in. choke.

EAST COLE POOL—DUVAL COUNTY

Motes-Campbell's No. 1 Bruni, 150 ft. from NE and SE lines of Sec. 493, Myrtle E. Hale Subd., Mariano Arispe grant ..... Drlg. 2,025 ft.; sand 1,774-80 ft.; tested salt water.

GOVERNMENT WELLS POOL—DUVAL COUNTY

Capps & Smith's No. 6-A Duval County Ranch, 1,430 ft. from SE and 330 ft. from SW lines of SW Sur. No. 574 ..... Drlg. 1,920 ft.

Cox & Hamon's No. 5 State, 2,310 ft. from S and 1,490 ft. from E line of SW Sur. No. 60 ..... T.D. 2,246 ft.; comp. 83 bbls. an hour through open tubing.

Humble Oil & Ref. Co.'s No. 19 Paul White, Sec. 58, 4,290 ft. S and 990 ft. N lines of Sec. 58 ..... Drlg. 50 ft.

K. O. T. Oil Co.'s No. 3 Lundell, 1,470 ft. from S line, 1,170 ft. from W line of Sur. No. 48 ..... Drlg. 2,250 ft.; D.S. test 2,227-50 ft.; showed 6 thribbles oil.

Magnolia Pet. Co.'s No. 21 Duval County Ranch, 660 ft. E of No. 14 and 660 ft. N of No. 10 on 960-ac. tract in Sec. 205, J. Poitevent Sur. ..... Rigging up.

Magnolia Pet. Co.'s No. 22 Duval County Ranch, 990 ft. from S and 330 ft. from W lines of Sur. No. 209 .. T.D. 2,338 ft.; comp. 8 bbls. an hour through one-eighth in. choke.

Magnolia Pet. Co.'s No. 6 J. T. Johnson, 750 ft. from N line, 330 ft. from W line of SW Sur. No. 44 ..... Drlg. 1,345 ft.

McKay & Reed's No. 2 State, 330 ft. from S and E lines of S half NW Sur. No. 60 ..... Drlg. 75 ft.

Reynosa Oil Co.'s No. 5-B Duval County Ranch, 330 ft. from S line and 990 ft. from E line of SE Sur. No. 363 ..... Drlg. 505 ft.

Sun Oil Co.'s No. 39 Weiderkehr, 681 ft. W of No. 24 in Poitevent Sur. No. 359 ..... Drlg. 1,900 ft.

Sun Oil Co.'s No. 40 Weiderkehr, 660 ft. S of No. 27, Poitevent Sur. ..... Set 7-in. csg. at 2,269 ft.; T.D. 2,283 ft.; comp. 22 bbls. hr. through ¾-in. choke.

Sun Oil Co.'s No. 41 Weiderkehr, 660 ft. W of No. 13, Poitevent Sur. No. 361 ..... T.D. 2,254 ft.; comp. 3 bbls. hr. flush on open tubing.

Sun Oil Co.'s No. 42 Weiderkehr, Sec. 359, 660 ft. S of No. 40 ..... T.D. 2,280 ft.; comp. 32 bbls. hr. through ¾-inch choke.

Sun Oil Co.'s No. 43 Weiderkehr, 673 ft. S of No. 42 well. Drlg. 1,802 ft.

Sun Oil Co.'s No. 33 Weiderkehr, 330 ft. from S line, 990 ft. from E line of Sur. No. 359 ..... Location.

Sun Oil Co.'s No. 29 Weiderkehr, 1,650 ft. from W line, 330 ft. from N line of Sur. No. 359 ..... T.D. 2,306 ft.; running tubing.

Sun Oil Co.'s No. 44 Weiderkehr, 660 ft. S of No. 43, Sur. No. 359 ..... Location.

Sun Oil Co.'s No. 45 Weiderkehr, 660 ft. S of No. 32, Sur. No. 359 ..... Location.

Sun Oil Co.'s No. 46 Weiderkehr, 660 ft. S of No. 45, Sur. No. 359 ..... Location.

Sun Oil Co.'s No. 47 Weiderkehr, 660 ft. S of No. 46, Sur. No. 359 ..... Location.

The Texas Co.'s No. 6 Duval County Ranch Co., 330 ft. from S and E lines of SE Sur. No. 362 ..... T.D. 2,318 ft.; comp. 10 bbls. hr. on gas lift.

Texas Co.'s No. 12 Wendt, 320 ft. from N and W lines of Sec. 42 ..... T.D. 2,242 ft.; comp. 3 bbls. hr.

Trapshooter Reilly's No. 1-B C. W. Hahl, 200 ft. from W line, 330 ft. from S line of Blk. 26, Sur. 250 .... Location.

KINGSVILLE POOL—KLEBERG COUNTY

Ryals & Bartlett's No. 1 Fiato, 150 ft. from N line, 30 ft. from W line of NE SE Sec. 40, of Kleberg Town & Improvement Co. Sur. ..... R.U. and S.D.

JACOB POOL—McMULLEN COUNTY

C. R. Kennon's No. 1 Lark, 810 ft. from W line, 150 ft. from N line of 20-ac. tract, Blk. 27, Scrugham Sur. ..... T.D. 1,052 ft.; S.D.; unsuccessful cement job.

Loma Oil Co.'s No. 18 Jacob ..... T.D. 1,002 ft.; testing.

Loma Oil Co.'s No. 23 Jacob, 660 ft. S of No. 11, 330 ft. from E line of lease, Sur. No. 7 ..... Drlg. 850 ft.

Loma Oil Co.'s No. 24 Jacob, 660 ft. E of No. 23, Sur. 7.. Moving in.

CUEVITAS POOL—STARR COUNTY

Sun Oil Co.'s No. 5-B M. Guerra, 1,650 ft. out of NE cor. of "B" lease in La Sacatosa grant ..... Drlg. 1,050 ft.

Sun Oil Co.'s No. 5-C M. Guerra & Son, 1,320 ft. NE of No. 4-C La Sacatosa grant ..... Location.

Sun Oil Co.'s No. 1-D Guerra, 6,352 ft. from NE line, 3,300 ft. from SE line of La Sacatosa grant ..... Drlg. 2,605 ft.

AGUA DULCE—NUECES COUNTY

Camp et al's No. 2 King, 990 ft. S of N line, 330 ft. W of E line of Sec. 24, R. Garza Sur. ..... T.D. 2,685 ft.; S.D.

Garland Clymore's No. 2 Ollie Purl ..... Tested dry 3,238 ft.; cored; show oil 4,880 ft.; preparing to test.

SAXET FIELD—NUECES COUNTY

South Mineral Oil Co.'s No. 1 J. W. Page, E. Villareal Sur., 471 ft. from E line, 160 ft. from S line of 150-ac. tract ..... Drlg. 3,402 ft.

United Prod. Co.'s No. 3 Ollie Purl, Peters Subd. No. 3, Sec. 6, Blk. 3, C of Blk. 3 ..... Drlg. 600 ft.

LOS OLMOS POOL—STARR COUNTY

Los Olmos O. & G. Co.'s No. 57 Kelsey Bass, 150 ft. from N line, 568 ft. from W line of SE SW Sec. 6, Porcions 75, 76 and 77 ..... T.D. 640 ft.; standing; depth corrected.

WEST COLE POOL—WEBB COUNTY

Magnolia Pet. Co.'s No. 2 Benavides, Blk. 4, Sur. No. 697.. T.D. 2,329 ft.; comp. pumping 38 bbls. oil dly.

BYERSVILLE POOL—WILLIAMSON COUNTY

Otto Stolley's No. 1 Charles L. Byer, beginning at SE cor. of P. Cartwright Sur. SW 4,700 ft. along survey line then 950 ft. SE at right angles in P. Stoddard Sur. ..... T.D. 1,020 ft.; fishing.

ESCOBAS POOL—ZAPATA COUNTY

Texas Co.'s No. 39 Whitehead, on Serrito Blanco grant.. T.D. 1,319 ft.; comp. spraying oil and making 10,000,000 ft. gas daily.

W. E. West and J. P. Perry's No. 1 Garcia, 1,200 ft. from NW line, 200 ft. from NE line of Share 3 of Comitas grant ..... Drlg. 1,500 ft.

MARTINEZ POOL—ZAPATA COUNTY

W. R. Shankle and Wm. McGinley's No. 2 Manuel Trevino heirs, 330 ft. from W line, 150 ft. from S line of Blk. 15, Sur. No. 411 ..... T.D. 1,550 ft.; S.D.

MIRANDO VALLEY POOL—ZAPATA COUNTY

O. W. Killam's No. 1 R. Hinnant, 365 ft. from SE line, 158 ft. from SW line of Blk. 7, Sur. No. 10 ..... T.D. 1,772 ft.; abnd.

VILLA POOL—ZAPATA COUNTY

Danvers & Harrison's No. 1 Garza, 330 ft. from SE and NE lines of Blk. 102, Douglas Subd., Comitas grant.. T.D. 2,305 ft.; abnd.

Lauck Well in Sedgwick County, Kansas, Looks Good; Stafford County Wildcat Shows Oil

By JAMES McINTYRE

The most important oil discovery in Kansas in a long time was that of Lauck and others on the Jordan farm, C NW SW SE Section 6-28-1w, only a few miles distant from the southwestern city limits of Wichita, Sedgwick County. The well is owned by D. R. Lauck and Ben Lampi, of Wichita, and the farm is owned by a 64-year-old Wichita carpenter, F. U. Jordan, who inherited it from his mother, who is said to have bought it at a bargain as an investment or a speculation.

The well was not completed when this was written, but the most conservative estimate on the prospective production of the test was 1,000 bbls. per day, and some scouts reporting to their companies at their Tulsa headquarters estimated it as high as 2,000 bbls.

The well was reported in last week's Oil and Gas Journal and since that time a wholesale campaign of leasing has been going on extending all the way from the Valley Center Field down to Clearwater. It was a great week for Sedgwick County farmers with land near the discovery well.

The well has been opened at times in the past week and flowed freely, the oil being of high gravity and with a good gas pressure. The White Eagle Oil & Refining Co. has laid a line from the well to a loading rack on the Santa Fe railroad to take care of the production when the well is completed and the owners have had a battery of 1,600-bbl. wooden tanks set near the well.

Among the lease owners who have protection as near the well as they could buy are Continental Oil Co., Wentz Oil Corp., Derby Oil Co., Empire Oil & Refining Co., T. C. Johnson, E. B. Shawver, Sinclair Prairie Oil Co., Phillips Petroleum Co., Magnolia Petroleum Co. and the Gypsy Oil Co.

The Gypsy Oil Co. in particular is a heavy lease owner. Empire and Magnolia also own a substantial amount of acreage.

Wildcat Showing in Stafford

An important showing in a wildcat well in Stafford County was a feature of the week in Kansas. The well is Vickers Petroleum Co. and Phillips Petroleum Co.'s No. 1 Cravens, C SW SW NE Section 15-25-11w. Six-inch casing was set at 3,841 feet. Shale was drilled from 3,841-3,921 feet and then limestone was encountered. The hole filled 400 feet with oil, and then began flowing every hour. No estimates were received as to the size of the flows.

Production by Pools

Estimated daily average production of important pools in Kansas for the week ending March 24, and for the preceding week was as follows:

	Mar. 24	Mar. 17
Hollow	12,130	11,965
Rits-Canton	14,505	14,070
Voshell	7,810	7,780
Sedgwick County	6,135	6,800
Nikkell	5,105	4,835
Ellsworth County	3,016	3,421
Barton County	910	966
Rice County	9,237	9,499
Reno County	3,190	3,219
Ellis County	440	438
Kingman County	1,200	1,370
Stafford County	600	633
Russell County	6,675	6,717
Greenwood County	12,250	12,500
Butler County	17,000	17,200
Other pools	24,317	22,902
Total	124,520	124,315

McPherson County

Lario Oil & Gas Co. and others' No. 4 Hill, NW NE SE Section 23-19-2w, McPherson County, was acidized in Viola lime at 3,378-84 feet and swabbed 220 bbls. in 24 hours.

Youker and others completed No. 5 Eaton, NW SE NE Section 26-19-2w. It produced 70 bbls. a day naturally from chat at 2,928-82 feet.

Phillips Petroleum Co.'s No. 1 Tinsley, C SW SE Section 5-20-1w, was dry and abandoned at 3,446 feet. It had the top of the Viola lime at 3,439 feet.

Sinclair Prairie Oil Co.'s No. 2 Schroeder-B, SW NW NE Section 4-20-3w, had a natural initial production of 1,120 bbls. from Hunton lime at 3,418-3,517 feet.

Vernon Oil & Gas Co. made a location for No. 1 Bengston, SE NW NE Section 13-19-3w.

Harvey County

Hollow and others' No. 1 Schmidt, SW SE NW Section 17-22-3w, Hollow Pool, Harvey County, was acidized after having been deepened from 3,464 to 3,473 feet and it produced 2,115 bbls. the ensuing 24 hours.

Frost and others abandoned the location for No. 5 Martins, NW SE SE Section 19-22-3w.

Shell Petroleum Corp. and J. E. Mabee, Inc.'s No. 6, SW NE SE Section 19-22-3w, was good for 1,588 bbls. in 24 hours from Hunton lime at 3,432-66 feet.

Producers & Refiners Corp.'s No. 1 Martens, NE NW SE Section 19-22-3w, was acidized at 3,435-60 feet and produced 247 bbls. initially.

Sinclair Prairie Oil Co.'s No. 5 Ediger, SW SE SW Section 19-22-3w, made 366 bbls. in 24 hours from Hunton lime at 3,495-3,507 feet.

Mid-Kansas Oil & Gas Co.'s No. 3 Klassen, NW NE NW Section 20-22-3w, was acidized at 3,325-55 feet and made 702 bbls. in 24 hours.

Sinclair Prairie Oil Co. made a location for No. 3 Schroeder-B, NE NW NE Section 4-22-3w. Derby Oil Co. was moving in material for No. 1 Hilbert, NE SW SE Section 5-22-3w. The Texas Co. staked location for No. 4 Anderson, SW NW SW Section 8-22-3w. Hollow and others made a location for No. 5 Schmidt, NE SW NW Section 17-22-3w; Sinclair Prairie Oil Co., a location for No. 4 Neufeldt, SE SE SE Section 18-22-3w; Sinclair Prairie Oil Co., a location for No. 6 Ediger, NW SE SW Section 19-22-3w; Stearns & Streeter, a location for No. 1 Froese, CWL NW NW Section 20-22-3w.

Russell County

J. J. Hall and others have an 80-bbl. well in No. 1, SW NW NE Section 31-14-13w, Russell County, total depth 2,975 feet.

Muth Brothers made a location for No. 1 Mills, SW cor. Section 10-14-15w, Russell County. Signal Oil Co. had a rig up for No. 1 Foster and Taylor, SE cor. Section 26-15-13w.

Davis and Hazlett made a location for No. 2 Weiland-B, NE NW NE Section 1-13-16w, Ellis County.

Greenwood County

Skelly Oil Co.'s No. 27 Wick, NW cor. SE SW Section 27-22-11, Greenwood County, was shot with 80 quarts at 1,879-1,965 feet and made 567 bbls. in 24 hours.

Butler County

Blakesley and Wentz' No. 1 Beedles, CWL NE SE Section 5-27-6, Butler County, had a hole full of water in Wilcox sand at 3,124½ feet, Hunton lime at 3,116-22 feet, was acidized and produced 15 bbls. in 24 hours.

Penwest Oil Co. has made a location for No. 1 Wilson, NE NW NW SW Section 36-25-4. Harvey and Gore made location for No. 1 Young, SE NW NW Section 27-26-7, and Cosmic Oil Co. had a machine in for No. 1 Loomis, NW SW NW Section 15-27-4.

Rice County

In Rice County, Gypsy Oil Co. had cellar dug for No. 3 Malone, NW SE NW Section 18-20-9w. Werber and others had cellar ready for No. 3 Macemore, NE SW NW Section 18-20-9w.

Garden and others had rig on the ground for No. 1 McCracken, NE cor. Section 10-21-7w.

Hoe Homer and Deitrick made location for No. 1 Fitzpatrick, C NE NE Section 30-21-8w.

Reno County

Sinclair Prairie Oil Co. had cellar dug for No. 4 Base, C NE SE Section 26-23-4w, Reno County.

Wildcat Operations in Kansas

Week Ending March 24

(Descriptions are East unless marked otherwise)

BARTON COUNTY

Company, farm and location—	Remarks:
Skelton et al's No. 1 Ott, C SE SE Sec. 16-19-14w	P.B. to 3,255 ft.; acidized; pumping wtr.
Walter Shearen et al's No. 1 Kempler, SE NE NE Sec. 31-18-11w	Material.

BUTLER COUNTY

DeGenther et al's No. 1 Marnane, NW cor. Sec. 29-26-3	Cellar.
Yarnell et al's No. 1-A Speer, SE NE NE Sec. 31-23-4e	U.R. 6-in. csg.; T.D. 3,210 ft.
Tom Palmer and Darby Pet. Co.'s No. 1 Harder, NW NE Sec. 27-24-3	Rigging up.
Van Meter et al's No. 1 Moore, NE cor. Sec. 5-25-4	Rig.

DICKINSON COUNTY

Dutch Oil Co.'s No. 1 Phillips, C NE NW Sec. 15-15-1e	Drlg. 100 ft.

ELLIS COUNTY

Ashby et al's No. 1 Polycyn, NE SE Sec. 12-13-16w (O.W.D.D.)	T.D. 3,125 ft.; pumped 45 bbls. oil, 35 bbls. water.

ELK COUNTY

Lerke et al's No. 1 Mason, C NE NE Sec. 5-31-10	Set 8-in. csg. 675 ft.

FINNEY COUNTY

National Ref. Co. et al's No. 1 Smith, C SE SW Sec. 2-23-29w	T.D. 3,323 ft.; S.D.

GREENWOOD COUNTY

Ackman et al's No. 1-A Gilroy, SE SW NW Sec. 24-25-12.	Spudded.
Oko O. & G. Co.'s No. 1 Austin, C SE Sec. 11-22-10	Rigging up.

KINGMAN COUNTY

Stanolind and Amerada's No. 1 Hilger, SE cor. NW Sec. 16-26-4w	Drlg. 3,581 ft.

McPHERSON COUNTY

Tom Palmer's No. 1 Nordling, SE SW Sec. 19-18-2w	Rig.
Slick, Pryor & Lockhart's No. 1 Ordineal, SE SW SE Sec. 21-20-3w	Rig.
Foraker & Hutchins' No. 1 Smyser, SE NW Sec. 28-20-3w	Cellar.
Continental Oil Co. et al's No. 1 Graber, NE NW Sec. 32-21-1w	Location.
Phillips Pet. Co.'s No. 1 Tinsley, C SW SE Sec. 5-2-1w	Drlg. 3,285 ft.
Jim Madison's No. 1 Boesker, SE NW Sec. 29-20-1w	Spudded.
Harris & Haun's No. 1 Rupp, SW cor. Sec. 12-21-2w	Drlg. 3,115 ft.
Wakefield & Hawkins' No. 1 Smith, SW SE Sec. 17-17-1w	Underreaming csg. to 3,152 ft.

PHILLIPS COUNTY

Ashby et al's No. 1 Close, C SE Sec. 24-5-18w	T.D. 2,350 ft.; running 6-in. csg.

RENO COUNTY

Stanolind and Amerada's No. 1 Hilger, SE NW Sec. 16-26-4w	Drlg. 3,968 ft.

RICE COUNTY

Lario O. & G. Co. and Elwell's No. 1 Russell, NE SW Sec. 29-23-7w	T.D. 3,774 ft.; C.O.
Geo. Dickey et al's No. 1 Hunter, NE cor. Sec. 26-19-7w	T.D. 2,355 ft.; U.R. 10-in. csg.
Langston et al's No. 1 Markle, NE SW Sec. 1-20-9w	T.D. 1,057 ft.
Reserve Dev. Co.'s No. 1 Heinz, NE SW SE Sec. 8-18-10w	Location.
Smith & Ash et al's No. 1 Wilkins, SE cor. Sec. 13-17-10w	Drlg. 400 ft.

ROOKS COUNTY

Ashby et al's No. 1 Stockton, C SW SW Sec. 15-8-19w	Drlg. 2,200 ft.
Phillips Pet. Co.'s No. 1 Dopitz, C SW SW Sec. 31-6-17w	Drlg. 1,955 ft.

RUSSELL COUNTY

Western Exploration Co.'s No. 1 Andres, SW cor. Sec. 30-15-12w	Drlg. 2,241 ft.

SEDGWICK COUNTY

D. Lauck and Shoreline Oil Co.'s No. 1 Jordan, NW SW SE Sec. 6-28-1w	Wilcox 3,652 ft.

STAFFORD COUNTY

Vickers Pet. Co. and Phillips Pet. Co.'s No. 1 Cravens, SW NE Sec. 15-25-11w	Set 6-in. csg. 3,835 ft.

SUMNER COUNTY

Wentz and Continental Oil Co.'s No. 1 Kerns, SE cor. NE Sec. 6-34-1w	T.D. 4,178 ft.; R.U.S.T.
Central Commercial's No. 2 King, C SE SW NE	Drlg. out cave; T.D. 4,015 ft.

WOODSON COUNTY

Lewis Bros.' No. 1 Riggs, SW cor. Sec. 19-24-14	Set pipe at 745 ft.; S.D.

South Penn Sales Gain President Curry Reports

The Pennsylvania crude oil situation had changed so much by the latter part of last year, says P. H. Curry, president of South Penn Oil Co., in the annual report, that the company did not have sufficient current production to supply the needs of its refinery customers and consequently had to withdraw from its storage. Net income shown was all realized during the last half of the year, Mr. Curry states, adding that during the early months of 1933 the price of crude was lower than at any other time during the past 30 years.

The company confined its drilling operations to the Bradford Field, where, under the water-flooding method, 84 wells were drilled for the introduction of water and 70 for the extraction of oil. Anticipated production from these wells should be realized by this summer, says Mr. Curry.

No additional payment was received from Consolidated Oil Corp. in respect to the sale to it of Penn Mex Fuel Co. stock, but production from the Penn Mex properties has reached the point where additional payments will begin with March production, it was said.

Binger Test, Caddo County, Holds Attention of Oklahomans; 7,500 Barrel Well at Crescent

By JAMES McINTYRE

At the opening of this calendar week most of the attention of Oklahoma oil men continued to center on the Denver Producing & Refining Co.'s test in the Binger district of Caddo County. The well, No. 1 Adak-noc, NW SW SW Section 34-10-10w, was a controversial subject during the past week. Some were inclined to discount its importance, while others held to the opinion that the Denver company made a very important discovery and that the well will prove a good one. It is so deep, 9,982 feet, present total depth, that in order to make it pay, the well will have to produce very generously, but whether or not it proves to be a big well, it is surely a fact that the company drilling it has opened up a big region of prospective oil territory.

The crew was given a 10,000-foot sand line late in the week, but up to this writing the bailer had not been lowered deeper than 6,800 feet. The column of mud in the hole has been so churned about by the gas that the top of it is within 1,500 feet of the top of the hole. On Sunday and early Monday the well made flows of oil, but the flows were of short duration and did not clean out the hole much. A later report on the well will be found in the late field reports on Page 31.

Interesting results have been obtained in the test of Anderson & Kerr, No. 1-A Hull, 455 feet south and 330 feet west of C Section 11-18-4w, in the township just west of the Crescent Field in Logan County. The well flowed 300 bbls. in 24 hours from Layton sand at 4,772-77 feet.

The Stanolind Pipe Line Co. has bought the Producers Pipe Line Co.'s lines and is now taking the production which formerly ran to the Bristow refinery of the Producers Oil Co., which was closed recently because it could not get enough crude oil. It has been running about 1,000 bbls. per day.

Oklahoma Production

Estimated daily average production in the week ending March 24 and in the preceding week was as follows:

	Mar. 24	Mar. 17
Allen	8,910	8,615
Bristow-Slick	10,500	10,500
Cushing-Shamrock	13,500	13,750
Chandler district	6,500	4,500
Healdton	9,300	9,100
Hewitt	5,150	5,000
Burbank	17,750	17,500
Balance of Osage	23,000	23,000
Lucien	5,800	3,595
Logan County	3,105	1,580
Bowlegs	11,430	12,015
Carr City	6,570	6,870
Earlsboro	9,960	9,985
East Earlsboro	13,315	12,855
South Earlsboro	1,190	1,460
Little River	16,170	17,520
East Little River	730	865
Seminole	13,080	12,205
East Seminole	985	1,095
Searight	2,660	2,545
Maud	1,330	1,375
Mission	4,620	4,810
St. Louis-Pearson	23,095	24,490
Cromwell	4,700	4,750
Oklahoma City	166,475	180,945
Tatums	7,955	7,880
Sholem-Alechem	4,450	4,500
Duncan	4,450	4,500
Tonkawa-Garber-Thomas	6,750	6,750
Fish	2,790	2,790
Konawa	2,540	2,460
Gray	2,875	2,735
Graham	3,600	3,500
Holdenville-Fish	3,850	3,640
Wewoka	4,750	4,500
Yale-Jennings	5,000	5,000
Other fields	71,970	70,780
Total	499,705	510,560

April Allowables

April daily allocations of oil production to Oklahoma fields, decided upon after a lengthy conference Friday by the Corporation Commission and its proration division, found slightly more than half the 20,000-bbl. daily increase goes to the unprorated areas, another fourth goes to the Wilcox zone of the Oklahoma City Field, and the remainder goes to Crescent, Lucien and Keokuk Falls. The new total is 476,400 bbls. per day.

The allowables are as follows: Unprorated areas, 179,158 bbls., increase of 10,058; Wilcox zone of Oklahoma City Field, 125,889 bbls., increase of 5,000; Simpson zone, 46,835 bbls., no change; Fault Line zone, 468 bbls., no change.

The Wilcox zone is permitted to run its current underage and in addition one-fourth of the remaining deferred underage of last autumn.

Class B pools, comprising Greater Seminole, Tatums and Fish-Cromwell, 111,518 bbls., same as March; Lucien, 7,000 bbls., increase of 1,651; Keokuk Falls, 960 bbls., increase of 261; Class D or wildcat pools, same as March.

The commission granted the petition of the Gypsy Oil Co. for a change in classification of the Crescent Pool in Logan County from D to C and increased the daily allowable 3,000 bbls. to a new mark of 3,500 bbls.

Nothing definite was done in regard to the South Burbank and Naval Reserve Fields in Osage County. The action of the commission recommending 200-bbl.-per-day-per-well production in South Burbank and a maximum of 300 bbls. per day per well in the Naval Reserve Field will be considered by the Interior Department. If Secretary Ickes approves, either the department or the commission is expected to issue an order to that effect.

Crescent Field operators claim the field has a potential production of 36,780 bbls. a day from 11 wells. They asked for a 5,000-bbl. daily allowable.

Osage County

Carter Oil Co., Bay Oil Co. and Norbla Oil Co.'s No. 1 Oliphant, NW cor. SE Section 10-25-6, set 5-inch casing at 2,818 feet, found Burbank pay sand at 2,827-52 feet. The well flowed 1,217 bbls. naturally in 24 hours and 1,613 bbls. the second day. No. 2 is drilling and rig was being built for No. 3, NE NW SE, and location has been made for No. 4, NW NE SE Section 10.

Mead Brothers and others' No. 3, SE cor. SW Section 10, was completed. This well flowed 2,712 bbls. in 24 hours after the shot.

Kasishke and others' No. 2, NE cor. SW Section 15-25-6, found Burbank pay at 2,753-93 feet. It flowed by heads 560 bbls. in 24 hours.

Carter Oil Co. and Norbla Oil Co. were moving in rotary for No. 6, SW SE NE Section 10-25-6. Champlin Refining Co. had cellar dug for No. 2, SW cor. NE Section 18-25-6. Sinclair Prairie Oil Co. had cellar dug for No. 2, SE cor. NW Section 15-25-6.

Texas Co. made location for No. 9, NE NE SE Section 30-25-8.

In the Naval Reserve Pool, Champlin Refining Co.'s No. 8, C SW NW SE Section 16-24-7, was completed. It was shot with 120 quarts in Bartlesville sand at 2,586-2,665 feet and started at 720 bbls. per day. Same company's No. 9, 1,320 feet south and 303 feet east of C Section 16-24-7, was shot with 120 quarts at 2,592-2,671 feet and started at 876 bbls. per day. It was completed.

Lewis Production Co. and Continental Oil Co.'s No. 2, 806 feet south and 300 feet west of C Section 16-24-7, flowed 675 bbls. the first 24 hours after a 140-quart shot at 2,606-70 feet.

Norbla Oil Co.'s shallow test, No. 2, SE cor. NE Section 25-24-7 (a twin), was dry and abandoned in sand at 704-14 feet, which showed only water.

Continental Oil Co. and Pinney was drilling at 200 feet in No. 2-A (twin), SE cor. SW Section 15-24-8.

Peters Petroleum Corp. and Oliphant's No. 7, C SW Section 32-24-9, is a 15-bbl. well in lower Cleveland sand at 1,583-1,614 feet. It was completed.

J. Garfield Buel abandoned No. 14, 800 feet from south line and 1,270 feet from west line, SE Section 28-23-8. It was drilled 5 feet into granite, topped at 2,385 feet. The well had been deepened from 1,726 feet. There was no Wilcox sand or Siliceous lime.

Murray Ringgold and others' No. 3, 800 feet north and 990 feet east of C Section 25-21-8, had Layton sand at 1,095-1,130 feet, shot with 80 quarts and swabbed 40 bbls. in 24 hours. It was completed.

Charles F. Bissett made a location for a well in the NE NW NE Section 9-21-9.

Noble County

In the Lucien Pool, Noble County, the Lucien Consolidated's No. 1 Boley-B, C SE NE Section 18-20-2w, was delayed by a fishing job. It had first Wilcox sand at 5,060-5,128 feet; began flowing about 2 bbls. per hour at 5,115 feet; got second Wilcox sand at 5,148 feet and drilled to 5,206 feet. The well flowed 810 bbls. in 24 hours. It was fishing for two strings of tools.

Minnehoma Oil Co.'s No. 2 Schonwald, C SE NE Section 20-20-2w, had first Wilcox sand at 5,121-91 feet and drilled to 5,202 feet. It swabbed 200 bbls. The crew was cleaning out.

The only new work was a location made by the Skelly Oil Co. for No. 2 Long, C SW NW Section 28-20-2w.

Sinclair Prairie Oil Co.'s No. 1 Bohn, C NW NE Section 29-20-2w, had 2,000 feet of oil in the hole from first Wilcox sand at 4,995-5,000 feet, total depth 5,007 feet. It was depened to 5,025 feet, and flowed 117 bbls. in 19 hours. It was drilling ahead.

Stanolind Oil & Gas Co. and Amerada Petroleum Corp.'s No. 1 Bohn, C NE NE Section 29-20-2w, found first Wilcox sand at 4,984-5,031 feet and flowed 633 bbls. in 12 hours. It was deepened to 5,054 feet, and flowed 854 bbls. in 24 hours.

Logan County

The largest producing well thus far drilled in the Crescent Pool in Logan County, was the Carter Oil Co. and Gypsy Oil Co.'s No. 1 Herron, C SE NE Section 28-17-4w, a north offset to the Carter-Gypsy discovery well. It was brought in through tubing and flowed 535 bbls. the first hour and 7,500 bbls. the first 24 hours. Sand was topped at 6,204 feet and the total depth was 6,223 feet.

The Amerada Petroleum Corp. completed No. 1 Denny, C SE SE Section 33-17-4w. It flowed 3,197 bbls. in 24 hours from Wilcox sand at 6,140-67 feet.

The above two wells represent the most northerly and the most southerly of a north and south row of seven completions in the field, all of them big wells. Altogether there are 12 producing wells in the pool, some of them producing from upper sands. They are permitted to produce only 50 bbls. per day under the proration schedule, although some of them are good for 5,000 bbls. per day or more.

Lincoln County

In the Chandler district, Lincoln County, the Twin State Oil Co. completed its No. 1 Cook, SW cor. Section 1-14-3, previously reported as having made 1,760 bbls. the first 24 hours, cut 8 per cent by water.

Magnolia Petroleum Co. had a hole

Wildcat Operations in Oklahoma

Week Ending March 24

Northern Oklahoma

ATOKA COUNTY

Company, farm and location—Remarks:

Malernee et al's No. 1 Greenville, N. B., NW SW Sec. 35-2s-13e ..... S.D. 550 ft.

ALFALFA COUNTY

Acre et al's No. 1 Acre, C SW NE Sec. 14-24-11w ..... Drlg. 6,460 ft.

BECKHAM COUNTY

West Oak Gas Co. et al's No. 1 Powell, NW SW Sec. 11-9-25w ..... T.D. 3,345 ft.; will run 8-in. csg. and test.

CADDO COUNTY

Denver Prod. & Ref. Co.'s No. 1 Noe, NW SW SW Sec. 34-10-10w ..... Set csg. to 9,922 ft.

COAL COUNTY

Moore & Deaner's No. 1 Edward, NW NE SE Sec. 27-2-8 ..... Drlg. 1,630 ft.

Fink & Russell's No. 1-A Miller, SE NE Sec. 10-2-8 .... Dry and abnd. 2,950 ft.

Westheimer & Daube's No. 1 Lowman, C NE SE Sec. 18-2-8 ..... Drlg. 2,320 ft.

CREEK COUNTY

McBride et al's No. 1-A Wickham, NE NW SE Sec. 3-15-7 ..... Drlg. 3,795 ft.

DEWEY COUNTY

Continental Oil Co.'s No. 1 Beaumer, SW NE Sec. 3-19-20w ..... T.D. 4,032 ft.; drlg. plugs.

GARFIELD COUNTY

Indian Terr. Illum. Oil Co.'s No. 1 Clark, C NW NW Sec. 34-21-6w ..... Drlg. 6,430 ft.

Argo O. & G. Co.'s No. 1 Dickman, SW cor. SE Sec. 13-24-1w ..... Rigging up.

Ross Cummings et al's No. 1 Gage, SE NW Sec. 27-22-3w ..... Rigging up.

GARVIN COUNTY

Anderson & Kerr's No. 1 Rodke, NW NE NW Sec. 21-4-1w ..... T.D. 4,955 ft.; standardizing.

Carter Oil Co. et al's No. 1 Hanner, SW NE NW Sec. 24-5-1w ..... Rig.

Denver P. & R.'s No. 1 Newburn, C SE SW Sec. 22-5-1e.. Location.

Phillips Pet. Co.'s No. 1 Dennis, SE NE Sec. 9-4-1e.... T.D. 4,670 ft.; P.B. to 4,190 ft.

HUGHES COUNTY

Dickison et al's No. 1 Webster, NW NE Sec. 22-10-10.. Rig on ground.

J. B. Hill's No. 1-A Perkins, C W½ SW SW Sec. 7-5-9.. S.D. 900 ft.

Birk-Kan's No. 1 Gardner, NE NW Sec. 22-6-9 ..... Moving in tools.

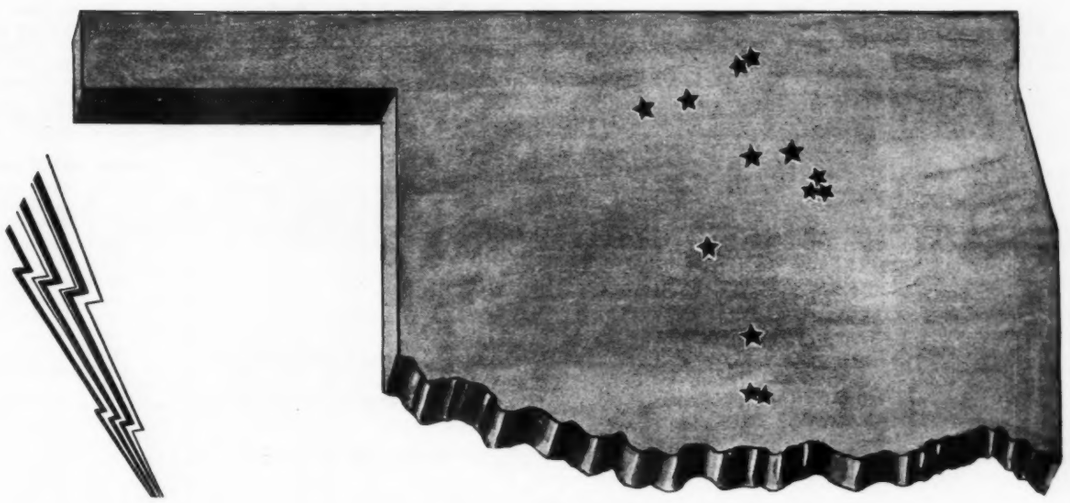
Olympic Oil Co.'s No. 1 McClassen, SE NW NW Sec. 12-9-8 ..... T.D. 600 ft.; lost tools; S.D.

Scruggs et al's No. 1 Black, NE Sec. 13-9-10 ..... T.D. 3,075 ft., U.R. 8-in. csg.

(Continued on Next Page)

Oklahoma Refineries Use *Purchased*

ELECTRIC POWER



★ indicates refineries now being served by Oklahoma Gas And Electric Company.

Continental Oil Company	Ponca City
Empire Oil & Refg. Co.	Ponca City
Wilcox Oil & Gas Co.	Bristow
Marathon Refining Co.	Bristow
Producers Refining Co.	Bristow
Tidal Refining Co.	Drumright
Deep Rock Oil Corp.	Cushing
Garber Refining Co.	Garber
Eason Oil Co.	Enid
Black Gold Refining Co.	Oklahoma City
Texas & Pacific Coal & Oil Co.	Wynnewood
Imperial Refining Co.	Ardmore
Cameron Refining Co.	Ardmore

Because it is more economical, more dependable, more satisfactory in every way, these Oklahoma refineries use purchased electric power.

Like other divisions of the petroleum industry, they, too, have discovered that purchased electric power saves money.

Today, Oklahoma Gas and Electric Company is serving 13 refineries in this state with a connected load of 15,000 H. P. Whether you need it for drilling, producing or pipelines we can furnish you with an unlimited supply of purchased electric power. With it there is no waste . . . you pay for only what you use.

OKLAHOMA GAS AND ELECTRIC COMPANY

Commercial Department

OKLAHOMA CITY **OKLAHOMA**

full of water in its No. 1 Sedore, SE SW NE Section 2-14-3, from Wilcox sand at 5,135-45 feet. It was shut down.

Magnolia Petroleum Co.'s No. 3 Wagner, SW SE SE Section 2-14-3, flowed 2,913 bbls. in 24 hours from Wilcox sand at 4,998-5,013 feet, total depth, and was completed. Same company completed its No. 4 Wagner, NE SE SE Section 2-14-3, in Wilcox sand at 5,040-51 feet, total depth, and it flowed 4,577 bbls. in 24 hours.

Amerada Petroleum Corp. and Stanolind Oil & Gas Co.'s No. 4 Brill, NW NE NE Section 11-14-3, was drilling at 4,990 feet, and Sinclair Prairie Oil Co. was also close to completion in its No. 1 Hopkins, SW NW NW Section 12-14-3, running casing to 4,954 feet. Amerada Petroleum Corp. and others were likewise close to the end in No. 1 Cragg, NW cor. Section 12-14-3, bailing and drilling plug at 4,963 feet.

In its wildcat test, No. 1 Stanley, C SE NE NW Section 33-14-3, Indian Territory Illuminating Oil Co. was drilling at 5,252 with no showing. This test had Hunton lime at 4,995 feet; Sylvan shale at 5,040 feet; Viola lime at 5,155 feet, dense at 5,185 feet; dolomite at 5,203 feet; sandy dolomite at 5,222 feet, and Wilcox sand at 5,230 feet, total depth 5,252 feet.

Eastward in the older Chandler Pool, Magnolia Petroleum Co.'s No. 3 Telford, SE cor. Section 7-14-4, found Wilcox sand at 4,992-5,007 feet, total depth. It flowed 2,139 bbls. in 24 hours, with a showing of water.

Slick-Urschel, Inc., completed its No. 3 Mayer, NE NW NW Section 17-14-4, previously reported as having had an initial production of 1,048 bbls. from sand at 5,011-19 feet.

In this end of the Chandler Field, several wells were close to completion, including Magnolia Petroleum Co.'s No. 4 Telford, Section 7; Sinclair Prairie Oil Co.'s No. 2 Mayer, Section 17; Magnolia Petroleum Co.'s No. 2 Green, Section 18, and same company's No. 3 Wagner, Section 18.

Amerada Petroleum Corp. and Stanolind Oil & Gas Co.'s No. 1 Martinek, NW SE Section 13-13-5, discovery well in the Wilzetta district, Lincoln County, was completed in Hunton lime topped at 4,241 feet, total depth 4,288 feet. It had an initial production of 840 bbls. of oil and 365 bbls. of water and later swabbed 580 bbls. of oil and 185 bbls. of water. Wilcox sand at 4,518-26 feet produced nothing but water. The hole was plugged back to 4,230 feet and redrilled to 4,288 feet.

Sinclair Prairie and others' No. 1 Boland, SW cor. Section 26-12-3, discovery well in the Meeker Pool, Lincoln County, was rigged up to pump. This test had Wilcox sand at 5,455-61 feet and flowed 120 bbls. in 45 minutes and later swabbed 293 bbls. in 13½ hours, and swabbed down.

Payne, Pawnee and Creek Counties

In Pawnee County, the Big Four Petroleum Co. is building rig for No. 1, on an unnamed farm, SW cor. NW Section 19-20-8.

In Payne County, Magnolia Petroleum Co.'s No. 2 Chevalier, NW cor. SE Section 27-19-4, Yale district, an old well deepened, was drilling at 3,989 feet, with no showings. It had first Wilcox sand at 3,897-3,932 feet, and second Wilcox sand at 3,940-55 feet. Mulberry Oil Co.'s No. 4 Fischer, a twin, SW cor. NE Section 27-19-4, drilled to 3,820 feet and plugged back to 3,808 feet. Eight-inch casing had been set at 3,773 feet. The well swabbed 80 bbls. in 24 hours.

In Creek County, F. O. Akin and others' No. 1 Scruggs, SE SW NE Section 32-18-8, was a hole full of water from Bartlesville sand at 2,824-60 feet. It was drilled to 2,945 feet and abandoned.

O. O. Owens completed No. 1 Elle, NE SE Section 33-18-8. It was shot in Red Fork sand at 2,700-16 feet and swabbed and flowed 110 bbls. in 24 hours.

Doke and Hughes completed No. 4 Rentie, SW cor. SE Section 34-18-8 (corrected location), had Layton sand at 1,296-1,332 feet and after a shot produced 22 bbls. in 24 hours. It was completed.

Marrs and others' No. 6 Wilson-A, CWL NE NE Section 34-18-8, had Layton sand at 1,297-1,326 feet, and made 75 bbls. in 24 hours after a shot. It was completed.

Texas Co.'s No. 2 Harry, NE SW SW Section 35-18-8, was plugged back to 3,096 feet and acidized but with no commercial results in oil and was abandoned. It had been drilled to 3,100 feet. It had swabbed oil and water, but the acidization increased only the water.

Papoose Oil Co. got a hole full of water in No. 1-A Barnett, NW NE NW Section 7-18-9, in sand at 2,587-2,603 feet, total depth 2,677 feet, and was abandoned. This location had been incorrectly reported as No. 1 Read, SE SW Section 6-18-9.

Mead Oil Co.'s No. 2 Taylor, NW cor. Section 2-17-8, was completed. It swabbed 100 bbls. in a day from Dutcher sand at 3,129-40 feet.

J. E. Crosbie's No. 2 Casey, NW NE SE Section 3-17-8, was shot in Layton sand at 1,345-75 feet and was estimated as a 75-bbl. initial producer.

Slyman and others shot No. 1 Hendrickson, SW NW NW Section 4-17-8, at 1,447-84 feet. The hole bridged and the crew was cleaning out.

A. D. Whitten completed a small well in No. 1-B Bowlegs, 450 feet north and 150 feet west of SE cor. Section 1-17-9, in sand at 1,750-88 feet.

New work first reported in Creek County include the following: F. O. Akin's No. 1 Eastman, NE SE NE Section 6-18-8, location; A. B. Ice and others' No. 1 Herrod, NE NW SE Section 16-18-8, rigging up (previously mentioned as No. 1 King, NE cor. SW), Section 16-18-8; Suppes & Thomas' No. 1 Brown, NE SW NE Section 16-18-8, building rig; Doke & Hughes' No. 5 Rentie, SE SW SE Section 34-18-8, rigging up, and No. 6, SE cor., location; Texas Co.'s No. 3 Harry, SW cor. Section 35-18-8, cellar; Bay State Oil Co.'s No. 1 Tiger, SE SW SW Section 3-17-8, location; same company's No. 2 Tiger, NE SW SW Section 3-17-8, location; Magnolia Petroleum Co.'s No. 1 Street, NE cor. Section 3-17-8, to deepen from 1,349 feet.

Oklahoma County

No completions were reported from the Oklahoma City Field.

G. D. Warr had location made for No. 1 Carney, SE SW SW NE Section 22-11-3w.

Springrose Drilling Co. and others' test in the Newalla district, C SE SE Section 19-11-1e, which found Hunton lime at 6,025 feet and a show of oil at 6,045-79 feet, total depth, flowed 63 bbls. in 24 hours, with 2 per cent water.

Tulsa and Wagoner Counties

B. G. Goble completed his No. 3 Lovett, CWL NE SW Section 35-18-15, Wagoner County. Sand at 998-1,006 feet was shot and the well produced 35 bbls. in 24 hours. No. 4 Lovett was drilling at 680 feet, and No. 5, SE NW SW Section 35, was rigging up.

Cahill and others had machine in for No. 4 Tiger, CEL SE NW Section 2-17-15, Coweta district, Wagoner County.

Okmulgee and Muskogee Counties

Adcock and others were drilling at 1,120 feet in No. 1 Roe, NE SE SE Section 21-16-15, Muskogee County.

Carr & Peterson had machine in for No. 10 Ware, SE SW SW Section 9-15-14, Okmulgee County, and Taylor & Geiger were drilling at 275 feet in No. 1-A Barnett, SW SE SE Section 8-15-15, Muskogee County.

J. E. Wallace completed No. 10 Bassett, a 15-bbl. initial producer in Section 15-14-14.

Gled Oil Co. had machine in for No. 20 Fox, NW NE NE SW Section 22-13-14, Morris district, Okmulgee County, and had location made for No. 18 Doyle, SW cor. NW Section 28-13-14.

Eagle-Picher Oil Co.'s No. 2 Burgess, NE SE SW Section 26-12-12, Henryetta district, deepened from 2,342 feet to 2,720 feet, got a hole full of water and was abandoned.

Okfuskee County

McBrayer, Rapp and others completed No. 2-A Barnett, a twin, SE SW NW Section 25-11-11, Okfuskee County. It is a 15-bbl. initial producer from Deaner sand at 2,354-80 feet.

Greater Seminole Field

In the Keokuk area in Seminole County, Carter Oil Co. and others were building rig for No. 2 Keokuk C-28, C S half NW NE Section 2-10-6. Merva Oil Co. has machine in for No. 1-A Johnson, SW NW NE Section 10-10-8, Red Mountain district.

Verser, Clay & Co. were moving in rotary to start No. 1-A Butler, SE NW NE Section 20-9-6, Seminole district.

Sinclair Prairie Oil Co.'s No. 2 Maxey, NW SE NW Section 1-8-6, Bowlegs district, had Wilcox sand at 4,160-81 feet. It was shot twice with 20 and 24 quarts, and swabbed 90 bbls. in seven hours.

J. A. Ligon abandoned the location for No. 1 Kiker, Block 143, Wewoka, SW cor. SE Section 19-8-8, and Ligon & Todd abandoned the location for No. 2 Kiker, Block 146, Wewoka, 394 feet from the north line and 345 feet from the west line NE Section 30-8-8.

Dingee and others' No. 1 Thomas, SE NE NE Section 9-7-4, South St. Louis, Pottawatomie County, got Hunton lime at 3,655-3,717 feet. It flowed 125 bbls. of oil in 24 hours. It will be deepened.

Elbar Oil Co. was moving in rotary for No. 2 Wyatt, SW NW NW Section 10-7-4.

Fox & Butler's (formerly reported as James and others'), No. 1 Banta, SE NW SE Section 32-7-4, was completed. It swabbed 457 bbls. after an acid treatment in dolomite at 4,235-71 feet.

Magnolia Petroleum Co. had rig up for No. 2 Martin, NE SE NW Section 34-7-4, and Empire Oil & Refining Co. made

(Continued on Page 152)

Wildcat Operations in Oklahoma

(Continued from Preceding Page)

KAY COUNTY

Argo O. & G. Co.'s No. 1 Freese, SW NE NW Sec. 30-25-1w ..... Location.

LINCOLN COUNTY

Amerada Pet. and Stanolind O. & G. Co.'s No. 1 Martinek, NW SE Sec. 35-13-5e ..... Swabbed 580 bbls. oil and 185 bbls. water at 4,230-88 ft.
Anderson & Kerr's No. 1 Huckabee, SW cor. Sec. 9-15-2.. Drlg 1,700 ft.
Huckleberry et al's No. 1 Boland, SW cor. Sec. 25-12-3e.. Sand 5,455-61 ft.; will pump.
Harvey Newman Oil Co.'s No. 1 Rueb, C NW NE Sec. 23-15-5 ..... Cellar
I. T. I. O. Co.'s No. 1 Stanley, C SE NE NW Sec. 33-14-3 ..... Drlg. 5,252 ft.

LOGAN COUNTY

Anderson & Kerr's No. 1-A Hull, 455 ft. S, 330 ft. W of E cor. Sec. 11-18-4w ..... Drlg. plug at 4,778 ft.
W. N. Anthony's No. 1 Fruin, SE SW Sec. 4-16-1 ..... Rig.
Amerada and Stanolind's No. 1 Fouts, NW NE Sec. 14-17-1w ..... Wilcox sand 5,098-5,102 ft.; flowed 650 bbls. in 24 hrs.; second Wilcox 5,240-46 ft.; H.F.W.; plugged back to first Wilcox.
Barnsdall Oil Co. et al's No. 1 Seyller, NE SE Sec. 12-15-4w ..... Drlg. 6,620 ft.; in Wilcox sand.
Jadeka Dev. Co.'s No. 1 Frakes, C SW NE SW Sec. 16-15-6w ..... S.D. 2,531 ft.

OKLAHOMA COUNTY

Gypsy Oil Co. et al's No. 1 Harris, C SW NE Sec. 27-13-4w ..... Location.
Springrose Drlg. Co.'s No. 1 Edwards, C SE Sec. 19-11-1 ..... T.D. 6,079 ft.; acidized in Hunton lime; flowed 63 bbls. by heads in 24 hrs.; 2 per cen: wtr.

OSAGE COUNTY

Peters Pet. Co. and Norbla Oil Co.'s No. 1, SW cor. Sec. 15-25-5 ..... Spudded.
Empire O. & R. Co.'s No. 1, SE NE Sec. 3-25-3 ..... Spudding.

PAWNEE COUNTY

Geo. Thomas' No. 1 School Land, SW cor. Sec. 13-20-5.. Drlg. 495 ft.

PITTSBURG COUNTY

Arkhoma's No. 1 Cummings, NW NE SE Sec. 6-4-12.... Drlg. 320 ft.
W. E. Hailey's No. 1 Drew, NW SW Sec. 21-3-14w ..... Spudded.
Mid-Western Oil & Gas Co.'s No. 1 Shelton, CSL SE NW Sec. 7-7-18 ..... Drlg. 1,950 ft.
Moffett & Hall's No. 1 Jones, C NE NW Sec. 14-8-14 .... Lost tools; T.D. 3,200 ft.; S.D.
Stencil Oil Co.'s No. 1 Chunn, SE NW Sec. 29-4-14 ..... Moving in tools.

PONTOTOC COUNTY

E. M. Blanchard's No. 1 Crabtree, NE SE NE Sec. 27-2-6.. Rig on ground.
Galbreath's No. 1 Stafford, NE SE SE Sec. 31-2-6..... Dry and abnd. 1,378 ft.
Stanolind-Amerada's No. 1 Aldridge, C N½ S½ SE Sec. 2-5-7 ..... Swbd. 20 bbls. oil, 20 bbls. wtr. from Gilcrease sand; bldg. tanks.
Emanuel, Rudman & Hatcher's No. 1 Mayer, C SW SE NW Sec. 7-3-8 ..... Material.
Delaney et al's No. 1 Dawes-Hardin, SE NW Sec. 30-3-7.. Drlg. 1,250 ft.

POTTAWATOMIE COUNTY

Deep Rock and Margay's No. 2 Adams, NW NE Sec. 11-6-3 ..... T.D. 3,805 ft.; dry and abnd.
Texas Pacific's No. 1 Franklin, SW NW SW Sec. 10-9-4. Drlg. 2,500 ft.
W. E. Witt et al's No. 1 Atwater-Fundis, NE NW NE Sec. 33-8-3 ..... Cellar.

SEMINOLE COUNTY

John Burns' No. 1-B Shepard, SE NE Sec. 4-8-8 (O. W.D.D.) ..... T.D. 1,658 ft.; S.D.
Carter Oil Co. et al's No. 1 Jarvis, C E½ NE SW Sec. 18-10-6 ..... Drlg. 4,247 ft.
Harman Oil Co.'s No. 1 Bowlegs, SE NE SW Sec. 1-7-7 ..... T.D. 1,450 ft. Fishing.
Flemlee et al's No. 1 Bowlegs, SE NE SW Sec. 1-7-7.... S.D. 1,260 ft.

WASHITA COUNTY

McWhorter & Bose's No. 1 Hale, NW SE NE Sec. 33-8.19w ..... Abnd. 300 ft.

Southern Oklahoma

ATOKA COUNTY

J. D. Boukan's No. 1 Howard, NW SW NW Sec. 20-2s-10e. Drlg. 1,135 ft.
Brookshire et al's No. 1 Rowland, NW NE NE Sec. 15-3s-10e ..... T.D. 3,443 ft.; fishing.

CARTER COUNTY

Angle & Lundy's No. 1-A Ringling, NE SW SW Sec. 11-5s-1w ..... Drlg. 2,707 ft.

GARVIN COUNTY

National Prod. Co.'s No. 1 Littrell, NE cor. Sec. 31-3n-3w. S.D. 299 ft.

McINTOSH COUNTY

Malernee et al's No. 1, NW SE Sec. 36-12-13..... Drlg. 1,075 ft.

MARSHALL COUNTY

Paul Robb's No. 1 Vittetoe, C NE SE Sec. 11-5s-4e..... T.D. 3,517 ft., will deepen.

MURRAY COUNTY

T. E. Revell et al's No. 1 Wolfe, NE cor. Sec. 14-1-2.... Drlg. 2,140 ft.

PUSHMATAHA COUNTY

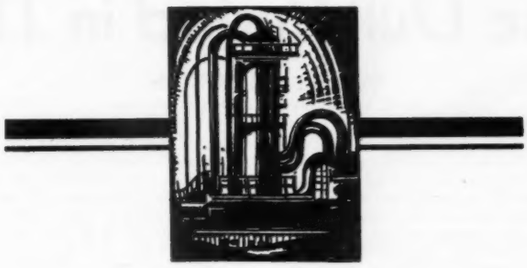
J. V. Sullivan et al's No. 1 Swink, C NE SE Sec. 19-4s-10e ..... Setting csg. 410 ft.
Whitehead et al's No. 1 Messer, SE SW SW Sec. 25-3s-18e. T.D. 2,405 ft.; S.D.

STEPHENS COUNTY

J. W. Madison's No. 1 Tussey, SW SE NW Sec. 24-1n-4w.. S.D. 3,210 ft.
Geo. Pace et al's No. 1 Siever, SE SW Sec. 4-1n-7w ..... Rig.
MacMo Oil Co.'s No. 1 Butler, SW NW SE Sec. 34-3s-7w.. S.D. 20 ft.

TILLMAN COUNTY

J. H. Everett's No. 1 Crane, SW cor. Sec. 15-3s-14w ..... Rig.



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TEXAS CITY, TEXAS

Converse and Zwolle Fields in Louisiana Prevent an Otherwise Dull Period in That Territory

By J. R. CRUMPTON
Staff Correspondent, Louisiana-Arkansas

SHREVEPORT, La., Mar. 26.—Outside of a few good producers in the Converse and Zwolle Fields of Sabine Parish, Louisiana, this division failed to report any outstanding developments during the past week. Although wildcatting continues fairly brisk, none of them now drilling was tested with the exception of the failures listed below.

The best well of the week was Earl Halliburton's No. 1 Burkett, Section 9-9-13, in the Converse Field. It is flowing from 1,000 to 1,200 bbls. daily from the Annona chalk at 2,030 feet through 2½-inch tubing. Acid was used at the total depth after setting 8-inch casing at 1,781 feet.

This field furnished three more of the six producers reported from this district. G. K. Fargo's No. 1 A. J. Burkett, Section 10-9-13, at a total depth of 1,935 feet, flowed 375 bbls. the first 24 hours, went dead and was completed flowing 200 bbls. daily. Two other wells, practically failures, were completed in the Converse Field. Reese & Martin's No. 1 E. Harris, Section 10-9-13, is pumping 200 bbls. of salt water and 5 bbls. of oil from 1,989 feet, and the Texas Trading Co.'s No. 1 H. J. Igsett, Section 9-9-13, is pumping 15 bbls. daily from 2,030 feet. This well drilled 6 feet into the sand below the Annona chalk to a total depth of 2,047 feet, but plugged back to the completed depth in the chalk after testing salt water.

From results of recent wells completed in the Converse Field, it would seem that the sand directly underlying the chalk is not proving up to be a prolific paying horizon. A few small wells have been brought in from this sand, but the operators of that field are reverting to the chalk pay, the base of which is about 2,000 feet. Much salt water has developed in the sand wells, whereas in the chalk, after the use of acid, the tests have been very consistent producers, large or small, without the presence of water.

East Zwolle Field

In the East Zwolle Field, George L. Pace's No. 4 F. Greer, Section 32-8-11, was completed flowing from 200 to 500 bbls. daily from a total depth of 2,500 feet. This is one of the few wells in that area that has resorted to the use of acid. The other producer from this district was the Shore Line Oil Co.'s No. 1 B. G. Davis, Section 36-22-16, in the Hosston area in the northern part of Caddo Parish. The well is pumping about 6 bbls. daily from the Nacatoch sand at 1,075 feet. Two of the Bossier Parish wildcats, the most active area in the North Louisiana district, were taken from the list during the past week as dry holes. C. B. Duffield's No. 1 Werner, Section 11-18-13, a few miles northeast of the city of Shreveport, was a duster at 3,529 feet. The base of the chalk was logged at 1,819 feet. In the northwestern part of the same parish, the Gulf Refining Co.'s No. 1 Murray, Section 30-23-13, was abandoned as dry at 2,792 feet after failing to get the pay in the Blossom sand. A previous test on this block failed to get a show in this formation and was abandoned in the Woodbine after testing dry. The two wildcats were drilled on a geophysical block consisting of about 8,000 acres, after being surveyed with a torsion balance and seismographic instruments. It is not known at the present writing whether other tests will be drilled on the acreage or not. The holes have been made by a gasoline core rig, capable of making 5,000 or more feet. The Converse area reported one of its rare results, a dry hole. Glassell and others' No. 1 Tatum, Section 9-9-13, developed salt water in the sand below the chalk at 2,021 feet and was abandoned. The base of the chalk was logged at 2,004 feet.

Watching Wildcats

Although the wildcats in the North Louisiana district did not show anything of interest during the past seven-day period, several of them are being closely watched for the testing period. The Bossier Oil & Gas Co.'s No. 1 Sherrill, Section 13-9-12, about 5 miles northwest of the Bellevue shallow field, Bossier Parish, is arranging to make a drill stem test of a good show at 2,100 feet. This well is only a short distance southwest of a previous test, drilled a few months ago, which developed a good gas flow, but developed salt water, due in all probability to drilling too deeply. The first well in this area, drilled about 10 years ago, flowed about 15 bbls. of pipe line oil for a long period from the same pay horizon. This test was about one-fourth of a mile northeast of the later wells.

In the same parish, John F. Anderson's No. 1 Leonard, Section 19-19-13, is coring lime at 2,740 feet. This test is a few miles northeast of the city of Shreveport, across Red River in Bossier Parish, and is in an area where several wells have been drilled, all of them encountering good shows of oil and gas at various depths. The Producers Oil & Gas Co. is making good progress to start up on its No. 1 Werner, Section 7-17-11, a wildcat northeast of the Sligo gas field in Bossier Parish. The operators have assembled about 2,000 acres, and during the past week sold 680 acres to the Arkansas Natural Gas Co. The contract calls for an even split if a well is brought in above the 3,500-foot level, and if a gas well is completed below this depth, the latter company is to pay the operators $50,000. If the test is an oil producer the consideration is $100,000. The test is on the northeastern flank of the known structure and will be drilled to 4,500 feet unless the gas pay in the Washita is picked up around the 3,200-foot level.

L. M. Moffitt has leased 6,500 acres in Bossier Parish, centering around the southeast quarter of Township 22, Range 12. The acreage is not blocked solidly, being checkerboarded, and carries no drilling contract. The lessor paid an average of $2 per acre with an annual renewal of $1 per acre. In DeSoto Parish, the Berry Oil Co. has staked location and is rigging up on its No. 1 Wemple in Section 14-12-11. A wildcat in the southern part of Caddo Parish failed to get a show on test after a good show from the chalk at 1,539 feet. A. D. King, trustee's No. 1 Sallie H. Roach, Section 4-14-16, bailed dry and acid may be used at the present depth before deepening. The test has a contract for a 4,000-foot hole, but the show of oil from the chalk necessitated setting 8¼-inch casing at 1,512 feet to test the show from the chalk rock.

A deep test in the Rodessa Field, northwestern Caddo Parish, has encountered another oil bearing sand in the Trinity, below the gas producing Oolitic lime in that area, and is preparing to test. R. W. Norton's No. 1-B French, Section 34-23-16, is setting a short string of casing at 6,717 feet and will run tubing before testing. A string of 5¾-inch casing was recently set in this well and a likely looking oil sand tested, but the cores were continued into salt water sand. Other wildcats in the North Louisiana district follow: DeSoto Parish, Bailey Gaunce's No. 2 Jenkins, Section 35-13-12, in the old Naborton Field, has set 15½-inch casing at 20 feet; Dempsey & Manziel's No. 1 T. D. Thigpen, Section 33-13-13, on a wildcat block north of the town of Mansfield, is rigging up; George M. LeGrand's No. 1 C. W. Faris, Section 19-11-15, in the southwestern part of the parish, has set 4½-inch casing to test at 2,465 feet; Rapides Parish, Ben Banner's No. 1 Bently Lumber Co., Section 11-6-6, has spudded in and drilling at 50 feet; Evers & Collingsworth's No. 1 Hickman, Section 40-4-1e, is drilling at 2,330 feet, and J. C. Prine's No. 1 Baum, Section 27-6n-2e, is drilling at 2,111 feet; Sabine Parish, Bridges Co., Inc.'s No. 1 Moore, Section 5-9-12, on the flank of the old Pleasant Hill Field, failed to make a producer from the Nacatoch, getting only a show of oil and gas at 1,610 feet. The top of the chalk was contacted at 1,635 feet and the test is drilling ahead at 1,750 feet. Mike Kissick and others' No. 1 Barr, Section 6-4-12, a wildcat in the southern port of the parish has set 10-inch surface casing at 140 feet. W. F. Lacey's No. 1 Logan, Section 2-9-13, about 1 mile north of proven production in the Converse Field, is testing a good show of oil and gas at 1,975 feet and the test may extend this field to that point.

ARKANSAS

This district reported two completions, both failures, and one hole abandoned after setting surface casing more than a year ago. In Jefferson County, L. L. Schumacher's No. 1 Danaher, Section 16-5s-9w, was dry and abandoned in the Paleozoic at 3,825 feet, and a Woodruff County test, John Wadkins' No. 1 Rosser, Section 7-5n-2w, was a duster at 2,022 feet. Capt. E. Byrd's No. 1 Westmoreland, Section 8-19-27, Miller County, was abandoned at 150 feet with 10-inch casing set at 80 feet. Drilling activity in this state has slowed down considerably during the past month, and none of the tests showed anything of interest during the past seven-day period.

Daily Average Runs

The fields of North Louisiana recorded an increase of 1,220 bbls. in the daily average runs during the past week, but the Arkansas district declined 145 bbls. to make a net increase of 1,070 bbls. for both districts. The daily average runs from the several pools were:

NORTH LOUISIANA

	Bbls.
Caddo light	4,475
Caddo heavy	1,655
Converse	1,730
Cotton Valley	550
DeSoto and Red River	1,510
Elm Grove	355
Haynesville	3,750
Holly	190
Homer	2,605
Pleasant Hill	220
Sarepta-Carterville	800
Urania	2,900
Zwolle	7,310
Total North Louisiana	28,050
Total last week	26,830
Increase	1,220

ARKANSAS

Champagnolle	1,200
El Dorado	2,450
Lisbon	385
Miller County	885
Nevada	790
Smackover light	2,495
Smackover heavy	19,875
Stephens	640
Urbana	2,240
Total Arkansas	30,960
Total last week	31,115
Decrease	145
Total both states	59,010
Total last week	57,945
Increase	1,065

Wildcat Operations in Louisiana-Arkansas

(Rotary operations unless otherwise designated)

North Louisiana

AVOYELLES PARISH

Company, well, farm name, section and block—	Remarks:
Haas & Stokes' No. 1 Lindstrum Land Co., 690 ft. S, 980 ft. E, NW cor. Sec. 34-1n-4e	Set 12-in. 40 ft.

BOSSIER PARISH

Bossier O. & G. Co.'s No. 1 Sherrill, 300 ft. S and W, NE cor. Sec. 13-9-12	Arranging to test 2,100 ft.
C. B. Duffield's No. 1 Wernet, Sec. 11-18-13	Dry and abd. 3,529 ft.
Gulf Ref. Co.'s No. 1 Murray, 1,120 ft. E, 1,520 ft. S, NW cor. Sec. 30-23-13	Dry and abd. 2,792 ft.
McKinney & Stewart's No. 1 Nattin, 470 ft. W, 620 ft. S, NE cor. Sec. 22-22-14	Drlg. 2,250 ft.
C. E. Reid, tr.'s No. 1 Doty, 730 ft. S, 618 ft. W, NE SE Sec. 7-16-11	Well killed and S.D. 3,020 ft.

CADDO PARISH

Ark.-La. P. L. Co.'s No. 1 Rodessa Land Co., 1,290 ft. N, 645 ft. W, SE cor. Sec. 23-23-16	Rigging up.
W. O. Bliss' No. 1 McDade, 330 ft. N and E, SW cor. NW NW Sec. 3-20-15	Used acid; W.O.S.R. 1,640 ft.
Burkett O. & G. Co.'s No. 1 Lindholm, 400 ft. S and E, NW cor. NE SE Sec. 15-17-14	S.D. 750 ft.

CALDWELL PARISH

Terrell & Price's No. 1 La. Central Lbr. Co., 300 ft. N, 300 ft. W, SE cor. NW NE Sec. 18-11-3e	Fishing for D.S. 2,080 ft.

CATAHOULA PARISH

T. R. Hincey's No. 1 Millsaps, Sec. 22-9-4e	Rigging up.

DE SOTO PARISH

Bailey Gaunce's No. 2 Jenkins, 330 ft. N and W, SE cor. SW SW Sec. 35-13-12	Set 15½-in. 20 ft.
Dempsey & Manziel's No. 1 Thigpen, 375 ft. S, 330 ft. W, NE cor. SW NE Sec. 33-13-13	Rigging up.
Geo. M. LeGrand's No. 1 Faris, 330 ft. S and W, NE. cor. SE Sec. 19-11-15	Setting 4½-in. 2,465 ft.

MOREHOUSE PARISH

Zeiger & Bacon's No. 1 Crossett, 400 ft. N, 300 ft. W, SE cor. Sec. 41-23-4e	S.D. 2,155 ft.

SABINE PARISH

J. F. Anderson's No. 1 Burkett, 135 ft. N, 655 ft. E, SW cor. NW Sec. 10-9-13	Fishing for liner 1,921 ft.

(Continued on Page 158)

Eleven Completions in Eastern Fields and Several Were Fair Oil Producers

BY STAFF CORRESPONDENT

PITTSBURGH, Pa., Mar. 26.—Eleven wells were completed in the lower Eastern fields during the week among which were several fair producers and one fair gas well. Five were gassers and six producers with an initial production of 275 bbls. There was one dry hole.

The major part of the work in the lower Eastern fields, at the present time, is in reconditioning old producers. Experiments are being conducted with treating lime sand wells with acid and so far it has proved successful in restoring production. Producers from othre sands are being cleaned out and shot. In one instance, a Bayard sand well is being prepared for treatment with hydrofluoric acid and it will be closely watched. Until the Pennsylvania Grade allowable is increased somewhere near the present demand, the present work is preliminary to a more concerted effort.

The largest well reported during the week was an old test in Southeast Ohio which was shot after producing naturally for two years. In Newcastle Township, Coshocton County, Preston Oil Co. completed a test on the A. J. and B. W. Beatty farm in the Clinton sand at 3,285 feet and it produced about 20 bbls. a day for two years. On March 15, it was shot and cleaned out. It is now producing about 175 bbls. a day.

In Belmont County, in the oil pool recently developed in Richland Township, Union Gasoline & Oil Corp. completed a second test on the Steve Evenek farm in the SW Section 20. It was drilled in to the Berea sand at 1,876 feet and is estimated good for 25 bbls. a day. In Section 25, same township, northeast quarter, Richland Development Association completed No. 3 on the John R. Lochary farm in the Maxon sand at 1,322 feet. It is a gas well showing for 248,000 feet a day and will be operated as long as the gas is in commercial volume. After that, it will be drilled to the Berea sand. The rig on No. 3 is now being torn down and will be rebuilt at a location for No. 4, immediately.

In the shallow sands of Medina County, E. R. Edson & Co. completed No. 43 on the Ed G. Miller farm, Tract 15, Lot 12, Chatham Township. It is making 10 bbls. a day after being shot in the Berea grit at 480 feet.

In Brush Creek Township, Muskingum County, Pure Oil Co. is drilling on the E. Gardner farm, Section 22. In the same district, Kline and others are drilling on the Clark Landis farm.

WEST VIRGINIA

Two producers were completed in West Virginia during the week. In Calhoun County, on the waters of Three Mile Creek in Sheridan district, W. F. Bickerstaff completed No. 3 on the William Cooper farm in the Salt sand at 1,980 feet. It is showing for 35 bbls. a day.

In Doddridge County, on Elk Lick of McElroy Creek in McClellan district, Murphy Oil Co. completed No. 10 on the W. B. Allen farm in the sand at 1,900 feet. It will make a 5-bbl. pumper.

In Battelle district, Monongalia County, South Penn Oil Co. shot No. 4 on the William Simpson farm in the Gordon sand and it is being cleaned out and is showing for about 3 bbls. a day. This well was a former producer in that formation but had been drilled deeper several years ago and converted into a gas well from the Bayard sand.

In Ritchie County, about 2 miles east of Petroleum on Lynn Run in Grant district, R. B. Roberts and othres have tubed their test on the J. G. Koehhlin farm and are pumping it once a week. It is averaging about 2 bbls. a day. They have started building a rig for a second test on this farm about 390 feet northwest of the test.

In Boone County, Pond Fork Oil & Gas Co. completed No. 16 on the Cole and Crane lease which was drilled deeper to 2,132 feet. It is a very light gas well at that depth. The location is in Washington district.

In Calhoun County, F. F. McIntosh completed No. 4 on the Mary E. Hays farm in Lee district in the Injun sand at a depth of 2,584 feet. It will make a small gas well.

In Wirt County there was a very fair completion. In Burning Springs district on the waters of Straight Creek, R. C. Waggoner completed a second test on the M. Richter farm at 2,002 feet and has a gas well showing for over 1,500,000 feet a day.

Drilling in West Virginia

In Lost Run Pool, Clay district, Ritchie County, two wells are drilling. C. F. Vincent & Co. are down 570 feet in No. 5 on the John T. and Ella B. Fox farm. Ralph Roberts and others have started drilling No. 3 on the Sada McGinnis farm about 500 feet northeast of No. 2. It has reached 605 feet. Richards Farm Oil Co. is getting ready to start a test on the Z. Dougherty and Mary Toothman farm and has the rig standing.

In other parts of Ritchie County, the following work is noted: In Grant district, Burgy and others are moving rig and tools on the Lillie Husher farm. In this district, Beech Run Oil Co. is down 970 feet on the Z. E. Neely farm. In Murphy district. L. U. and L. E. McClure have started drilling on the J. A. Gregg farm, and Clem Morris is down 1,780 feet on the F. B. Strother farm.

In Pleasants County, Dye Farm Oil Co. is down 860 feet on the Lavina Dye farm in Jefferson district. In McKim district, Ross Bonner and others have reached 1,750 feet on the Daniel Locke farm.

In Roane County, on the waters of Buffalo Creek in Curtis district, Reedy Oil & Gas Corp. is drilling deeper No. 1 on the L. D. Guthrie farm, formerly a gas well and now being deepened to the Salt sand for oil. In the same district, on the waters of Wiblin Fork, this company has started drilling on the D. E. Daellenbach farm, 1 mile south of No. 1 L. M. Riddle. In this district on Buffalo Creek, Henderson Oil Co. has rigged up for a second test on the F. H. Bee farm. In Spencer district, George E. Smith is running casing to 2,005 feet on the L. A. Short farm. Guy Boggess and others are rigging up on the William Stine farm. In Geary district, C. C. Clevenger reached 1,856 feet in No. 3 on the Mary L. Taylor and shut down testing.

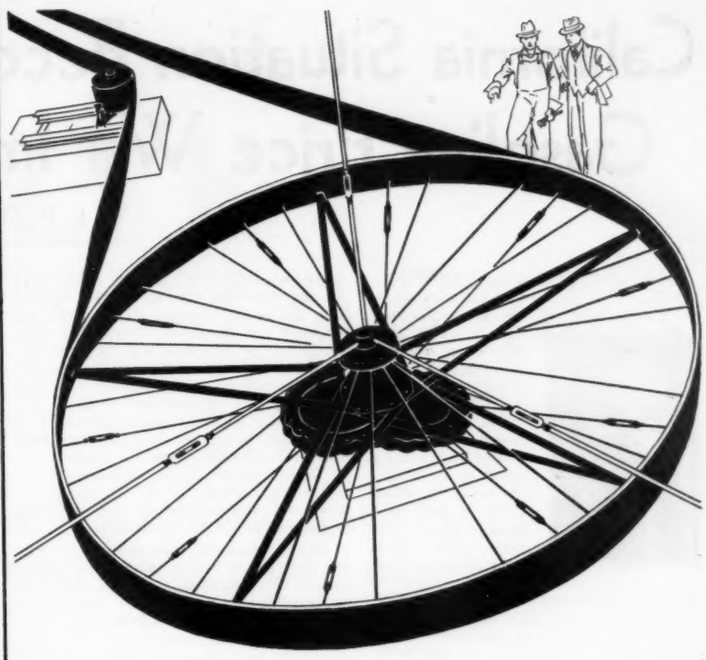
Calhoun County is void of drilling wells at the moment. Several locations have been reported and a few rigs are standing. In Gilmer County, C. A. Jarvis and others are down 476 feet on the Susan Gainer farm in DeKalb district. Laurel Oil & Gas Co. has reached 1,739 feet on the Floyd W. Beall farm.

In Marshall County, Manufacturers Light & Heat Co. is fishing for the tubing at 1,803 feet in No. 3,474 on the August Wend farm to drill deeper. This company is building a rig to drill deeper No. 3,512 on the James Reid farm and hauling in rig material for No. 3,513 on the J. C. Clouston farm. All are in Liberty district.

SOUTHWEST PENNSYLVANIA

There were two completions and one dry hole in Southwest Pennsylvania during the week. In Amwell Township, Washington County, Raymond Orrill and others completed No. 3 on the G. L. Walker farm in the Thirty-foot sand at a total depth of 2,667 feet. The Pitts-

(Continued on Page 138)



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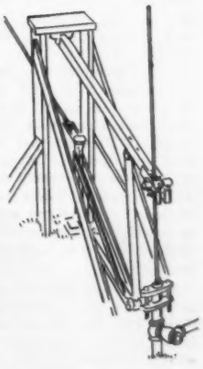

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California Situation Becomes Extremely Critical; Gasoline Price War Imperils Crude Structure

By L. P. STOCKMAN
Staff Correspondent, California Fields

LOS ANGELES, Calif., Mar. 26.—Conditions in California, due to a disastrous gasoline price war which has been in progress since March 1 and a substantial overage in crude oil production, have become extremely critical and may wind up in a battle royal, in which event it will be a case of survival of the fittest. The seriousness of the situation lies in the fact that marketers appear unable to stop the battle for gallonage despite the tremendous losses being sustained. Gasoline prices in Los Angeles area are down to the lowest level reached in many years and a check indicates that major companies are netting back substantially less than 5 cents per gallon. On the third grade structure, major refiners are netting back less than 4½ cents per gallon.

A few weeks ago 95.32 per cent of the marketers on the Pacific Coast were extremely optimistic and viewed the future with equanimity as the marketing cartel had been tentatively approved and it looked as though the industry might be able to go through the early spring months without experiencing the usual price war.

Contracts Terminated

Conditions in California were further complicated this week when major buyers terminated a number of day-to-day purchase contracts covering crude oil produced in the Playa Del Rey Field. The Union Oil Co. has been carrying this burden for the past two months in order to provide operators with a market for their production but has found it impossible to continue this policy due to the refusal of other marketers to absorb a fair share of the burden. As a result of this unfortunate situation, smaller refiners are buying current requirements from Del Rey operators at 40 cents per barrel but it is quite evident that this price will probably drop to about 25 cents per barrel within the next few weeks if operators are unable to dispose of their entire production. Approximately 2,500 bbls. per day of crude oil is involved and the price paid by major companies up to the time of cancellation was approximately $1 per barrel.

Termination of day-to-day purchases means the end of curtailment as far as Playa Del Rey is concerned because independent refiners are not concerned whether the oil bought in the spot market is produced under curtailment or not. This field will not show any great change in daily production, however, as the smaller refiners can handle only a certain amount of spot oil and also because of the fact that Playa Del Rey reached the settled stage several years ago. The most disconcerting feature in connection with the present situation is that this cheap crude will definitely prevent any immediate improvement in gasoline prices. This is quite obvious in view of the fact that refiners will undoubtedly buy this cheap crude and terminate day-to-day purchases in other fields where prices are higher.

The present situation confronting operators in the Playa Del Rey Field is a repetition of conditions existing immediately subsequent to discovery of the field by the Ohio Oil Co. It will be recalled that for several months major companies declined to purchase Playa Del Rey crude due to its rather high sulphur content. As a result of this condition, independent refiners were able to buy Del Rey crude at an average price of approximately 25 cents per barrel and this advantage permitted them to undersell marketers buying crude in other fields at higher prices. As a consequence the refined oil market was completely demoralized and ultimately led to price recessions in crude oil schedules.

Major companies were confronted with the problem of either rectifying the unsatisfactory condition at Playa Del Rey or continuing to sustain tremendous losses. They decided to pursue the former and subsequently posted crude oil price schedules and made day-to-day contracts to purchase all crude oil produced provided operators conformed with curtailment. The situation at Playa Del Rey is analogous to conditions existing in many other California fields in as much as buyers are purchasing crude oil on day-to-day contracts that can be cancelled on 24 hours' notice. If the present situation reaches the point where marketers find themselves unable to continue sustaining substantial losses they will either terminate these day-to-day contracts or reduce the posted price of crude oil in all fields.

Propose Embargo

Recognizing the possibility that crude oil prices may be substantially reduced in the near future unless the marketing end of the business is remedied, Long Beach operators have organized an Oil Producers Committee as a preliminary move to prevent crude oil from going into the hands of unscrupulous marketers. Sentiment is crystallizing among producers to regulate disposition of current production so that chronic chiselers and price cutters will be prevented from demoralizing the market at frequent intervals to the detriment of ethical marketers and operators who have consistently conformed with curtailment. The committee, headed by W. H. Geis, has forwarded copies of a resolution to refiners, marketers and to Federal and state authorities as well as to all district committees in the state.

The resolution adopted by Long Beach operators reads: "Be it resolved, that the Long Beach Oil Producers Committee calls upon the other district committees and upon each and every producer of crude oil in the state to join together and resist to the fullest extent further continuance of the present gasoline war. We cite the sacrifices made for the past four years by the oil producers in restricting the production of crude oil. These producers number over 700 in the state and directly employ 32,000 workers. We ask what equal sacrifices have been made by the refiners and marketers and reply that they have made no sacrifices, but that instead, they have conducted their respective operations in a most selfish, unbusinesslike manner, repeatedly causing disaster to the whole industry with the loss of employment and extreme financial losses to the petroleum and allied industries.

Recommend Action

"The committee does not wish to dignify itself, but when a group of refiners and marketers numbering only 35 can bring ruin to the 700 co-operating producers we cannot stand idly by without issuing this warning and stating that the responsibility will this time be properly placed and retribution demanded. To the producers we point out that if the impending break comes the final outcome will be based on the survival of the fittest, because the constructive marketers have reached the limit of their endurance and can no longer procrastinate with further unorthodox and unethical marketing. Producers should immediately investigate the market to which their crude goes for refining and if the purchaser thereof violates the code or indulges in price breaking the supply should be checked."

As the situation stands, it is a matter of whether or not marketers can prevent a reduction in crude oil prices. The situation at Playa Del Rey is bound to react unfavorably on the general market unless this crude can be absorbed at prevailing prices. Up to the present no one seems inclined to purchase this oil at existing prices although several independent refiners are openly offering 40 cents per barrel. There has been a serious deflection in the curtailment program during the past week with the result that crude oil production in the state approached the 500,000-bbl. mark and will probably continue at a high rate unless the chaotic condition is checked at once. Three substantial producers in the Long Beach Field have openly announced that they do not propose to conform with curtailment any longer and have accordingly resumed production activities to the fullest extent. These operators have refining units and will probably reduce purchases in order to utilize their own production and thus reduce refining costs.

Tideland Litigation

Rolland Vandegrift, state finance director, has announced that a contract has been negotiated with the Wilshire Oil Co. and its subsidiaries for the payment of $309,730 in back royalties accruing as a result of tideland exploitation in the Huntington Beach town lot area. Several weeks ago state officials filed suit against the Wilshire and alleged that the company had produced approximately 700,000 bbls. of crude oil from beneath state tidelands. As a result of the compromise, the Wilshire will be permitted to resume production on several wells that have been standing suspended but must conform with the curtailment program at least as far as tideland exploitation is concerned. The signing of this contract will also eliminate the possibility of prosecution for trespass as the Standard Oil Co. announced some time ago that it would grant the necessary easement to all operators who negotiated leases with the state. Up to date, royalty agreements have been signed covering a total of 16 wells but there are still approximately 50 wells that have not yet been settled. The finance director set a deadline with the statement that, "if the others don't sign within 30 days, we will take them into court and take 100 per cent of their production."

April Quotas

During the month of April, California fields will be given an allowable daily production of 462,500 bbls. although it is quite probable that the respective quotas may be somewhat below the allowable in order to provide for unforeseen contingencies and to make provision for the new production resulting from completion of new wells. San Joaquin Valley fields are given an allowable of 181,500 bbls. per day subject to slight variations or deductions for contingencies. The coastal districts, subject to the same provisions are given an allowable of 52,250 bbls. per day while Los Angeles Basin fields will be given a daily quota of 220,150 bbls.

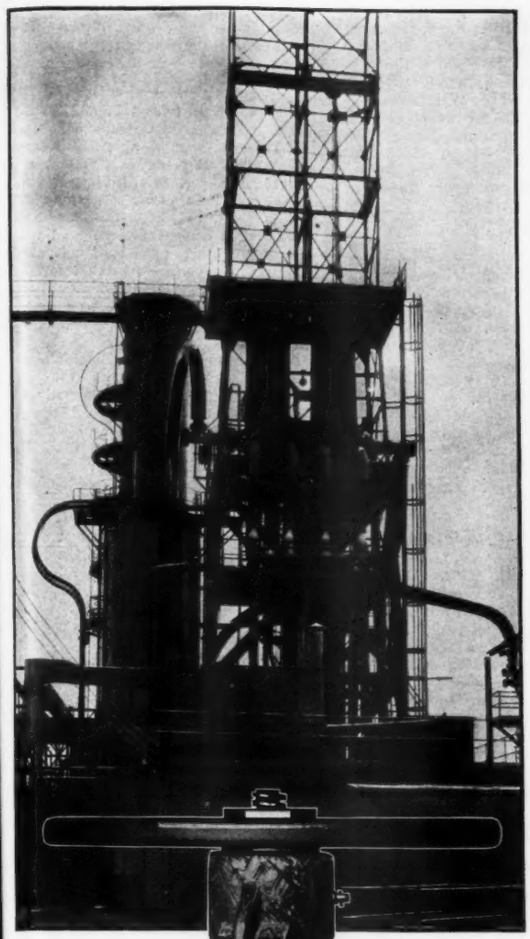
The increase of 8,600 bbls. in the April quotas is especially interesting in view of the existing demoralization in the crude and refined oil markets and this increased allowable may prove somewhat of an unwelcome gift if the bottom drops out and the law of supply and demand allowed to determine the allow-

TANKER SHIPMENTS FROM LOS ANGELES TO DOMESTIC AND FOREIGN PORTS

	March 11		March 4		Total	
Intercoastal-domestic—	Total this week	Daily average	Total last week	Daily average	This year to date	Same time last year
Crude oil	.....	.....	.....	.....	92,770	.....
Fuel oil	129,647	18,521	454,249	64,892	3,135,551	207,003
Diesel and gas oil	147,293	21,042	.....	.....	493,144	772,162
Gasoline	148,259	21,180	.....	.....	819,018	1,346,821
Kerosene	.....	.....	.....	.....	303,121	411,076
Other finished oil	.....	.....	.....	.....	.....	30,635
Other unfinished oil	.....	.....	.....	.....	.....	72,584
Foreign exports—						
Crude oil	191,385	27,341	4,975	739	1,454,593	1,219,896
Fuel oil	163,487	23,355	322,074	46,011	2,126,134	1,334,350
Diesel and gas oil	20,171	2,882	87,834	12,562	821,708	624,374
Gasoline	63,551	9,079	62,555	8,936	762,591	1,117,825
Kerosene	19,576	2,797	29,964	4,281	226,943	485,674
Other unfinished oil	.....	.....	.....	.....	34,363	.....
Coastwise-domestic—						
Crude oil	251,723	35,960	277,414	39,631	1,130,771	2,449,197
Fuel oil	382,110	54,587	163,847	23,407	2,377,735	2,336,322
Diesel and gas oil	.....	.....	19,144	2,735	132,694	367,788
Gasoline	96,155	13,737	54,647	7,807	1,822,218	2,216,136
Kerosene	3,023	432	4,493	642	28,895	29,159
Naphtha distillates	.....	.....	.....	.....	.....	27,651

TANKER SHIPMENTS FROM SAN FRANCISCO TO DOMESTIC AND FOREIGN PORTS

Intercoastal-domestic—						
Diesel and gas oil	.....	.....	.....	.....	313,695	280,531
Gasoline	.....	.....	.....	.....	72,625	239,016
Kerosene	.....	.....	.....	.....	80,925	311,855
Lubricants	.....	.....	.....	.....	8,310	8,250
Foreign exports—						
Crude oil	74,182	10,597	77,295	11,042	443,002	320,286
Fuel oil	.....	.....	14,781	2,112	176,487	190,939
Diesel and gas oil	5,402	772	71,440	10,206	330,580	300,145
Gasoline	.....	.....	.....	.....	565,907	1,064,941
Kerosene	.....	.....	.....	.....	131,662	167,050
Lubricants	.....	.....	3,550	507	21,460	28,270
Other unfinished oil	.....	.....	.....	.....	.....	4,881
Coastwise-domestic—						
Fuel oil	83,167	11,881	11,761	1,680	696,769	714,045
Diesel and gas oil	1,498	214	.....	.....	50,785	142,550
Gasoline	121,827	17,404	87,797	12,542	586,181	753,424
Kerosene	.....	.....	4,793	685	24,721	36,211



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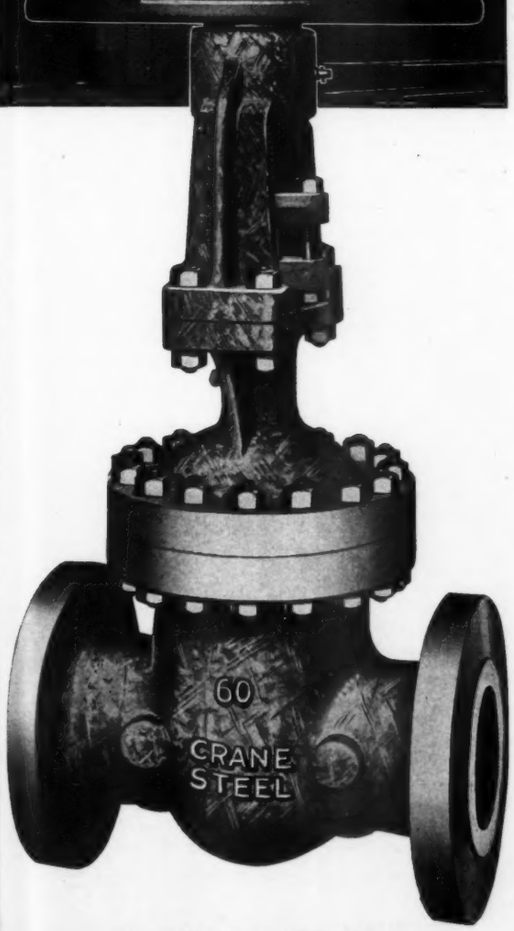


No. 76X Cast Steel Gate Valve

No. 845D 90° Elbow
Cast Steel

Crane Stream Line Return Bends
2-hole and 4-hole Box Header Return Bends

able production and the amount to be paid therefor. In other words we may have a perfectly sound allotment with no buyers for some of the production. On the other hand, we will undoubtedly have several substantial producers exceeding their prescribed allotments in order to reduce refining costs and reduce the marketing losses to a minimum.

Big Well

Development work in California during the current week resulted in the completion of a 20,950-bbl. well in the Kettleman North Dome Field when the Superior Oil Co. finished No. 7 Huffman at 8,800 feet. This new well, which is making 24,000,000 feet of gas per day in addition to its output of oil, was finished with 1,271 feet of perforated 7-inch liner landed on bottom. It was cemented through perforations at 8,000 feet, 8,137 feet and at 8,362 feet. The 7-inch liner was perforated at 7,572-7,991 feet, 8,137-8,237 feet and at 8,365-8,551 feet and is producing from the oil zone between these points. Development work in the Huffman area of the North Dome has been characterized by the completion of unusually large wells since the Superior Oil Co. finished the first well in that section about three years or so ago.

Both the Union and Superior have finished several large producers in the Huffman area, located in the extreme western end of the structure, although neither company has made any attempt to establish high potentials, as the allowable daily production of each is pegged and does not bear any relation to the amount of potential established. A month or so ago the Union conducted a short flow test on one of its wells in order to determine its true potential and this well flowed at the rate of approximately 15,000 bbls. per day for three or four days. The Union is drilling one new well on the Amerada King lease at present and should have this producer on production some time before the close of April. In the meantime, the company is erecting a new steel rig and rigging up boilers for the drilling of No. 6 King. The Union is developing this property in conjunction with the Amerada Petroleum Co., the original holder of the King lease. Both Kenda and the Standard are expected to list new completions in the North Dome as they have several potential producers drilling ahead in the pay at present. The Association's No. 56-8Q, in the eastern end of the North Dome structure, is getting rather deep at 9,120 feet and the barren gray sand cored at this depth does not look any too promising.

Mountain View

Another week or two should change the complexion of the Mountain View Field of Kern County as additional completions are scheduled to be finished during the interim. During the past several months this field has been more or less of an enigma due to dry holes where production was anticipated and the completion of good wells where the indications were not promising. Recent developments have indicated that the trend of production is to the northwest of the original area and consequently operators are centering their activities in that direction. Hogan Petroleum Co. is making preparations to finish its third well in this field and the production test on No. 3 Porter Day should be concluded within the next day or two. The Mohawk should also add a new producer to its list within the next few days, as No. 1 Bloemer in Section 30-30-29 has just been cemented in the pay.

A. T. Jergins is experiencing considerable difficulty in completing No. 1 Bloemer in Section 29-30-29, and L. E. Labadie is likewise having trouble with his No. 1 Cavanaugh in the same section. The Standard, Union and other progressive operators have leased considerable acreage northwest of the main field, and it is quite probable that a new well or two will be drilled in this area in the near future. This acreage is located north and a little west of the Union's No. 1 K.C.L. in Section 15-30-28. The Union has cored 30 feet of oil sand in this well, which is 2 or 3 miles from the nearest production, and operators are of the opinion that the company may have possibly encountered an edge condition in an adjacent field. Northeast of the Hogan Petroleum's discovery well, the Monterey Exploration Co. brought in No. 3 Duff pumping 200 bbls. of 15.6 gravity oil per day from 2,027 feet. This new well, which may possibly lead to additional drilling later on, is located in Section 15-30-29, in what is generally known as the Edison area.

Round Mountain

Honolulu Oil Corp. finished its first new well in the Round Mountain Field since resuming work after a suspension of several years, but the initial daily production of No. 18-1A failed to come up to expectations. This new well, finished early in the week, was brought in on the beam doing 45 bbls. of clean 12.5 gravity oil per day from 1,833 feet after the hole had been finished with a 6⅝-inch liner carrying 46 feet of perforated. The Honolulu had expected to undertake an active development campaign in the Round Mountain Field, but this small well may have a tendency to reduce future drilling. In the Mount Poso Field the Union spudded in No. 10 S.&M. and started reconditioning work on No. 9 S.&M., a recent completion which failed to clean up as expected.

The General Petroleum's deep test in the South Belridge Field of Kern County has taken on a rather dubious outlook at 10,605 feet in as much as the bit was still in brown shale at that point. The company has not yet shown any inclination to suspend drilling, however, and as a consequence this hole can not yet be classified as a duster despite its extreme depth. In the Lost Hills Field, the Associated is driling at 7,700 feet in No. 1 Williamson, a joint test which the company is drilling in conjunction with the Richfield Oil Co. The Western Gulf's wildcat north of the Coalinga Field is promising notwithstanding the rather prolonged test. The well is still in the same position as it was a few weeks ago as the crew is cleaning out the sand bridge a little at a time.

Dominguez

The Shell completed an excellent producer in the Dominguez Field of Los Angeles Basin this week when No. 26 Reyes was brought in under a natural flow doing 1,325 bbls. of 29.2 gravity oil and 2,400,000 feet of gas per day from the upper Callender at 4,482 feet. This well was finished with a 4¾-inch liner including 246 feet of perforated. The Union, which has staked locations for three new wells in this field, followed up its success of last week by completing No. 11 Hellman a few days ago flowing 475 bbls. of 28.6 gravity oil per day from 4,440 feet.

Associated Oil Co. has resumed production activities in No. 2 Vickers in the Inglewood Field of Los Angeles Basin and this well, which has been standing shut in for several years, was returned to production flowing 578 bbls. of clean 28.6 gravity oil per day. It is flowing from the Rindge zone, which will shortly undergo exploitation as a result of the approval of an acceptable drilling and production program submitted by operators. The Standard is preparing to begin drilling an offset at once and the Pacific Western has already spudded in No. 16 Cone, the rig for which had been erected several years ago when it looked as though this field would break loose. Several new wells are expected to be started in the Montebello Field within the next few weeks as operators are beginning to show some interest in exploitation of the deep Cruz zone.

Eastern Fields

(Continued from Page 135)

burgh coal was at 694 feet, the top of the Thirty-foot sand at 2,653 feet with oil and gas showing at 2,657 feet and oil at 2,667 feet. It filled up 1,400 feet in the 6¼-inch casing in three hours and is rated at about 25 bbls. a day. This well is being completed and will be put to pumping until exhausted. This bringing in a producer in that formation is rare in the district where all other tests in that vicinity have produced gas. The nearest Thirty-foot producer is about 2 miles distant.

In this township, Carnegie Natural Gas Co. is cleaning out its test on the C. W. Dunn farm after shooting the Fifth sand at 2,930-58 feet. There was but little oil showing. On the Fred Baumberger farm, this company is down 3,065 feet and drilling in the Fifth sand. The top of the Fifth sand was at 3,055 feet and in drilling to the lower pay a hard cap was encountered which is being drilled. There is about 1,400 feet of fluid in the hole. Philadelphia Oil Co. is moving in a rig on the Hulda Jenkins farm.

In Morris Township, Washington County, James McCracken & Co. are drilling at 540 feet on the H. B. Saunders farm. In South Franklin Township, E. H. and J. B. Tague have set a machine for No. 9 on the Adaline D. McKennan estate.

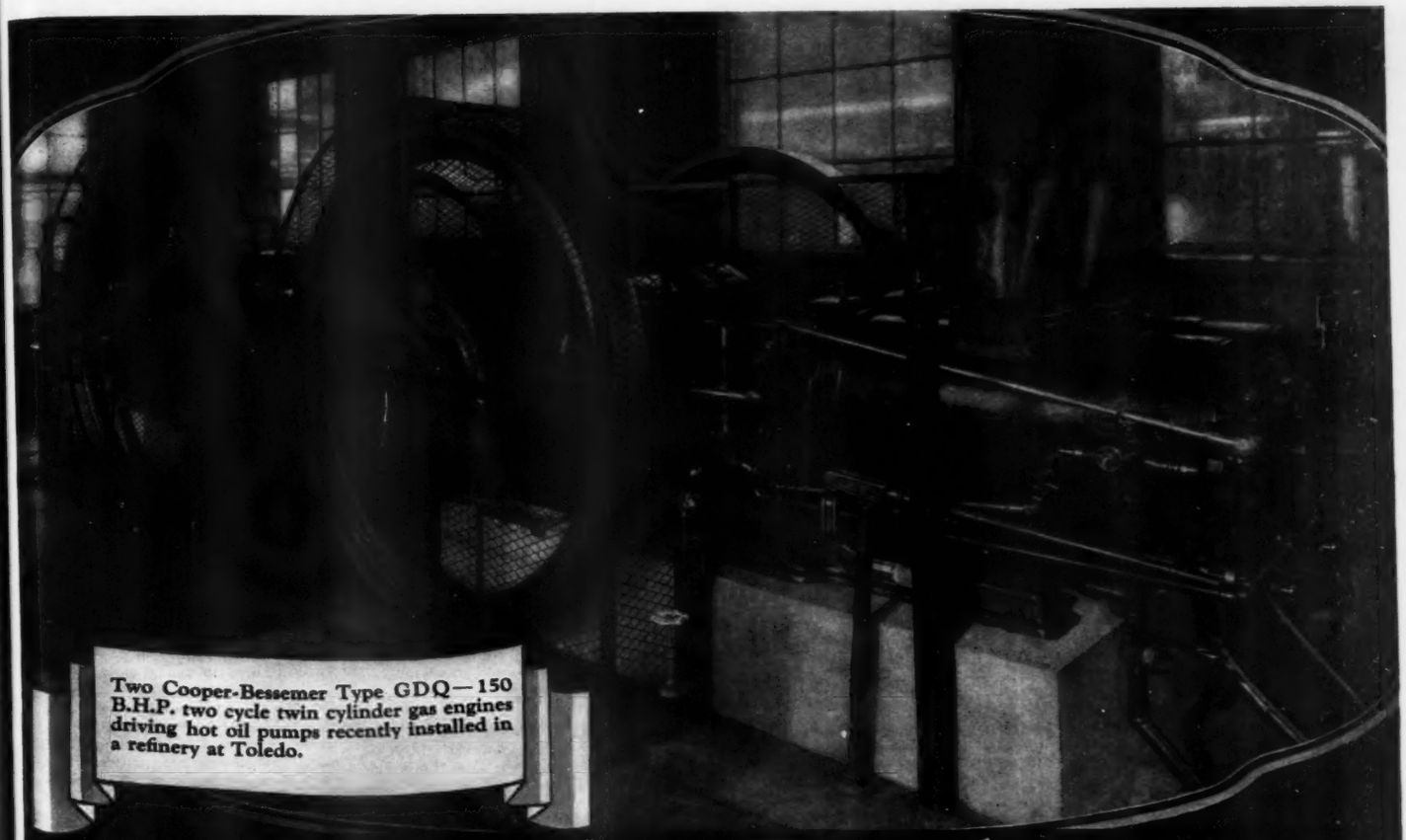
In Allegheny County, McVey and others drilled a test on the James Shaw farm in North Versailles Township, near the scene of the McKeesport gas pool, through the Speechley sand to 3,450 feet. There was a showing of about 50,000 feet of gas a day at 3,314 feet which blew down. The hole is being plugged.

IMPORTANT SOUTHERN CALIFORNIA WILDCATS

Company, well and location—	S-T-R	Depth	Status
Clayton, G. L., No. 1 Clearwater, Los Angeles Co.	31- 3-12	4,703	sd. sh. drilling
Pacific Dev. Co., No. 1 Watts, Los Angeles Co.	16- 3-13	3,879	suspended
Oklahoma Oil Corp., No. 1 Hermosa, Los Angeles Co.	31- 3-14	....	material
Domingues Oil Co., No. 1 Dominguez, Los Angeles Co.	34- 3-13	1,306	sd. sh. drilling
Quinn, J. B., No. 1 Dominguez, Los Angeles Co.	3- 4-13	2,203	sd. sh. drilling
Mutual Oil Co., No. 1 Dominguez, Los Angeles Co.	3- 4-13	4,511	cementing
Kelly & Son, No. 1 Torrance, Los Angeles Co.	7- 4-13	6,435	suspended
Wehrman, J. K., No. 1 San Pedro, Los Angeles Co.	14- 5-14	1,597	fishing D/P
Nudson, T. T., No. 1 Inglewood, Los Angeles Co.	17- 2-14	1,911	cemented
Pacific Western, No. 16 Inglewood Cone, Los Angeles Co.	8- 2-14	1,146	sd. sh. drilling
Scientia Oil Co., No. 1 Inglewood, Los Angeles Co.	7- 2-14	rig	suspended
Kiops Oil Co., No. 1 Inglewood, Los Angeles Co.	17- 2-14	rig	rigging up
Wilshire, No. 2 Potrero Deep, Los Angeles Co.	27- 2-14	5,300	sd. sh. drilling
Community Oil Co., No. 1 Montebello, Los Angeles Co.	34- 1-11	7,002	sd. sh. drilling
Community Oil Co., No. 3 Montebello, Los Angeles Co.	34- 1-11	....	material
Universal Consd., No. 2 Montebello Deep, Los Angeles Co.	5- 2-11	6,950	suspended
Universal Consd., No. 3 Montebello Deep, Los Angeles Co.	5- 2-11	7,287	fishing D/P
Texas Co., No. 1 Montebello Deep, Los Angeles Co.	6- 2-11	4,971	sd. sh. drilling
Standard, No. 1 Montebello Deep Los Angeles Co.	6- 2-11	3,550	sd. sh. drilling
St. Helens, No. 1 Montebello Deep, Los Angeles Co.	6- 2-11	114	sd. drilling
Pioneer Oil Co., No. 1 Pico, Los Angeles Co.	7- 2-11	rig	rigging up
Rex Anglin Dev. Co., No. 1 Los Nietos, Los Angeles Co.	29- 2-11	150	suspended
Eldorado Pet., No. 1 Puente, Los Angeles Co.	30- 2- 9	3,116	suspended
Barstow Oil Co., No. 1 Saugus, Los Angeles Co.	35- 5-16	2,136	suspended
International Dev. Co., No. 1 Saugus, Los Angeles Co.	34- 5-16	mtl.	building rig
Alexander, W. L., No. 1 Sunland, Los Angeles Co.	7- 2-14	906	hd. sd. drilling
Black Eagle Oil Co., No. 1 Huntington, Orange Co.	tideland	3,962	reaming
Nuoil Co., No. 1 Newport, Orange Co.	29- 6-10	6,276	br. sh. drilling
Recovery Oil Co., No. 1 Sunset Beach, Orange Co.	16- 5-11	3,400	suspended
Superior Oil Co., No. 1 Sunset Beach, Orange Co.	19- 5-11	5,811	redrill 4,074 ft.
Placentia Dev. Co., No. 1 Placentia, Orange Co.	31- 3- 9	4,501	hd. sh. drilling
Mid-Rich Drlg. Co., No. 1 Atwood, Orange Co.	26- 3- 9	212	suspended
Rubens, Sy., No. 1 Atwood, Orange Co.	19- 3-10	3,368	pumping test
Bardeen Pet., No. 1 Coyote, Orange Co.	13- 3-10	3,177	to deepen
Great American Pet., No. 1 Chino, San Bernardino Co.	18- 2- 8	2,645	suspended
Great American Pet., No. 2 Chino, San Bernardino Co.	18- 2- 8	2,600	suspended
Tehama Pet., No. 1 Santa Ana Canyon, S. Bernardino Co.	33- 2- 8	1,395	suspended

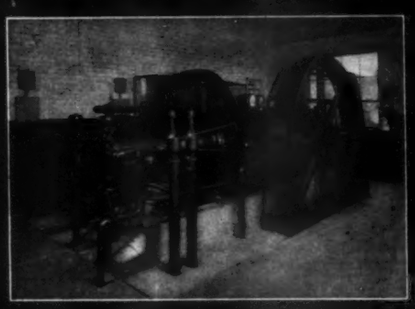
IMPORTANT NORTHERN CALIFORNIA WILDCATS

Company, well and location—	S-T-R	Depth	Status
General Pet., No. 9 Capitan, Santa Barbara Co.	32- 6-30	rig	suspended
Shell Oil Co., No. 2 Capitan, Santa Barbara Co.	32- 5-30	1,769	cemented
Lincoln Drlg. Co., No. 3 Summerland, Santa Barbara Co.	21- 4-26	2,803	suspended
Dietzmann, J., No. 1 Summerland, Santa Barbara Co.	16- 4-26	3,666	gas—shut in
Fairview Oil Co., No. 1 Purisima, Santa Barbara Co.	18- 7-34	2,161	hd. sd. drilling
York-Smullin Oil Co., No. 1 Purisima, Santa Barbara Co.	28- 8-34	3,000	pump 120 B/D
Barnsdall-Rio Grande, No. 8 Doty Elwood, Santa Barb. Co.	15- 4-29	4,868	set knuckle jt.
Signal Oil & Gas Co., No. 2 Elwood, Santa Barbara Co.	tideland	5,112	cleaning out
East Elwood Pet. Co., No. 1 Elwood, Santa Barbara Co.	14- 4-29	rig	rigging up
Cuyama Oil Co., No. 1 Cuyama, Santa Barbara Co.	12-10-27	4,002	sd. sh. drilling
Union, No. 1 Santa Maria, Santa Barbara Co.	19-10-33	1,730	showing O/G
Richfield, No. 3 Rincon fee, Ventura Co.	17- 3-24	2,557	cleaning out
Woodrow Pet., No. 1 Rincon, Ventura Co.	4- 3-24	7,612	suspended
Continental, No. 3 San Miguelito, Ventura Co.	23- 3-24	....	building road
Hancock Oil Co., No. 1 Fillmore, Ventura Co.	13- 4-19	3,357	pumping test
Oil Ridge Oil Co., No. 1 Fillmore, Ventura Co.	1- 4-19	642	cemented
Chappuis, Louis, No. 1 Seape, Ventura Co.	1- 4-20	....	location
Kneiper & Atha, No. 1 Bardsdale, Ventura Co.	7- 3-19	1,710	suspended
Williamson & Donaher, No. 1 Simi, Ventura Co.	36- 3-18	790	fishing
Dabney, H. R., No. 1 Simi, Ventura Co.	22- 2-18	1,505	suspended
Midlands Pet., No. 1 Ojai, Ventura Co.	9- 3-23	7,830	redrill 7,141 ft.
Prop. Service Corp., No. 1 Ventura, Ventura Co.	24- 3-23	....	building road
Laing & Jacobs, No. 1 Shields, Ventura Co.	32- 4-19	721	cleaning out
Kirk, W. A., No. 1 Sulphur Mountain, Ventura Co.	21- 4-22	1,810	br. sh. drilling
Mosher, J. W., No. 1 Santa Paula, Ventura Co.	22- 4-21	1,824	br. sh. drilling
Las Posas Pet., No. 1 Las Posas, Ventura Co.	22- 3-20	6,153	cleaning out
International Oil Developers, No. 1 Conejo, Ventura Co.	33- 2-20	3,042	hd. sd. drilling
Hub Pet. Co., No. 1 Gould Hills, Kern Co.	22-29-21	6,840	suspended
Shell Oil Co., No. 1 Gould Hills, Kern Co.	21-29-21	3,000	sd. sh. drilling
Standard Oil Co., No. 1 McKittrick, Kern Co.	15-30-22	rig	rigged up
Casa Mira Oil Co., No. 1 Belridge, Kern Co.	28-28-20	4,982	suspended
General Pet., No. 1 Belridge, Kern Co.	30-28-21	10,605	br. sh. drilling
Union Oil Co., No. 18 Belridge, Kern Co.	36.27-20	5,314	hd. sh. drilling
Wrenn, J. J., No. 1 Antelope Plain, Kern Co.	32-25-17	1,701	suspended
North American No. 1 Jasmine, Kern Co.	25-25-27	200	sd. sh. drilling
Associated, No. 1 Lost Hills, Kern Co	2-26-20	7,662	sd. sh. drilling
Howells Bros., No. 1 Round Mountain, Kern Co.	32-28-29	2,106	bl. sh. drilling
Semaphore Oil Co., No. 1 McVan, Kern Co.	14-27-27	231	sd. sh. drilling
Caribou Record Oil Co., No. 1 Kern Front, Kern Co.	11-28-27	2,084	pump. test
Shafter Oil Co., No. 1 Shafter, Kern Co.	8-28-25	2,612	sd. sh. drilling
Ohio Oil Co., No. 1 Buena Vista Lake, Kern Co.	31-31-26	6,000	sd. sh. drilling
Aita Oil Co., No. 1 Union Avenue, Kern Co.	6-30-28	6,470	redrill 4,040 ft.
Hall-Garner, No. 1 Mountain View, Kern Co.	26-30-28	rig	rigged up
Severns Drilling Co., No. 1 Mountain View, Kern Co.	24-30-28	4,708	sd. sh. drilling
Union Oil Co., No. 1 Mountain View, Kern Co.	15-30-28	5,787	cleaning out
Hogan Pet. Co., No. 3 Shell Mountain View, Kern Co.	29-30-29	5,804	prod. test
Hogan Pet. Co., No. 3 Mountain View, Kern Co.	29-30-29	6,060	suspended
Monterey Expl. Co., No. 1 Edison, Kern Co.	15.30-29	2,027	250 B/D
Labadie, E. L., No. 1 Mountain View, Kern Co.	29-30-29	5,888	testing
Standard, No. 1 Mountain View, Kern Co.	19-30-29	4,871	sd. sh. drilling
Commanche Oil Co., No. 1 Commanche, Kern Co.	15-32-29	2,292	sd. sh. drilling
Badger Oil Co., No. 1 Wheeler Ridge, Kern Co.	31-11-19	5,300	gr. sd. drilling
Russ Oil Synd., No. 1 Kingsburg, Fresno Co.	20-12-11	4,044	suspended
Bergman, Harry, No. 1 Kingsburg, Fresno Co.	12-12-11	4,961	sd. sh. drilling
Graham & Loftus, No. 1 Raisin City, Fresno Co.	20-15-18	5,906	suspended
Emerich Oil Co., No. 1 Mendota, Fresno Co.	35-13.13	4,575	suspended
Western Gulf, No. 1 S. P., Fresno Co.	15-17.15	7,892	cleaning out
Hogan Pet, Co., No. 1 Joaquin Ridge, Fresno Co.	28-20-16	6,605	suspended
Kent & McDonald, No. 1 Carrizo Plains, S. Luis Obispo Co.	3-22-22	3,830	suspended
Farrel Pet., well No. 1, San Luis Obispo Co.	18-31-12	1,095	reaming
Willet Oil Co., No. 2 Cholame, San Luis Obispo Co.	10-26-15	rig	rigged up
Commonwealth Consd. Gas Co., No. 1 Tulare Lake, Kings Co.	21-22-20	1,080	suspended
Tulare Basin Oil Co., No. 1 Tulare Lake, Kings Co.	2-23-19	1,200	gas—shut in
Douglas, J. M., well No. 1, Monterey Co.	36.22- 9	2,262	br. sh. drilling
Oakdale Oil Co., No. 1 Oakdale, Stanislaus Co.	5- 2-10	4,760	hd. sh. drilling
Pacific Northern Oil Co., No. 1 Guinda, Yolo County	23-12- 3	6,673	hd. sd. drilling
Buttes Oilfields Co., No. 1 Marysville, Sutter Co.	35.16- 1	2,731	gas—shut in
Buttes Oilfields Co., No. 2 Marysville, Sutter Co.	35-16- 1	4,320	suspended
Milham Exploration Co., No. 1 Tracy, San Joaquin Co.	5- 4- 5	2,362	hd. sd. drilling
Orland Oil Synd., No. 1 Orland, Tehama Co.	31-23- 3	3,790	suspended
Mid-Valley Oil Co., No. 1 Orland, Tehama Co.	14-24- 3	....	material
Tehama Pet., No. 1 Murdock, Glenn Co.	19-22- 5	100	sd. drilling



Two Cooper-Bessemer Type GDQ—150 B.H.P. two cycle twin cylinder gas engines driving hot oil pumps recently installed in a refinery at Toledo.

Gas Engines or Diesel Engines for Hot Oil Pump Drives



A Cooper-Bessemer Type GDT—200 H. P., two cycle twin cylinder gas engine driving a multi-stage centrifugal oil line pump through step-up gears — one of two recently installed in an Ohio refinery.

ALL those exacting qualities required of an engine (either gas or Diesel) for a successful hot oil pump drive—Cooper-Bessemer engines have them. Variable speed over wide limits, close speed regulation, speed automatically controlled by quantity of oil delivered by pump, extremely low maintenance cost, most important of all, reliability. There are thousands of Cooper-Bessemer gas engines pumping oil exclusively for over a full year without a shut-down. Cooper-Bessemer engines are available [illegible] H.P. for the most exacting service. Write for your copy of the booklet "Engines for Hot Oil Pump Drives."

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Michigan Well Jumped From 150 to 3,550 Bbls.; Wildcatting Is Spreading to New Districts

By PAUL A. ELLIOTT
Staff Correspondent, Michigan Fields

MUSKEGON, Mich., Mar. 26.—Michigan producers were greatly encouraged by a 2,000-bbl. increase in the State's allowable from 29,300 to 31,300 bbls. a day. The Michigan proration committee continued a schedule of 5 per cent above the minimum of 100 bbls. per well for the last two weeks of March with the possibility of a slight increase April 1 because of the increased allowable. The 5 per cent schedule will permit daily runs of about 28,000 bbls. in addition to making up underruns based on a state potential of 126,606 bbls. a day from 877 wells in 11 fields. Actual runs for February totaled 780,071 bbls., or an average of 27,860 bbls. a day. Runs by pools were: Porter, 516,368 bbls.; Chippewa-Greendale, 132,899 bbls.; Vernon, 66,686 bbls.; Yost, 20,063 bbls.; Leaton, 18,136 bbls.; Muskegon, 11,288 bbls.; Oceana, 5,425 bbls.; Ogemaw, 4,842 bbls.; Saginaw, 3,449 bbls.; Montcalm, 891 bbls. and Cass, 84 bbls.

Daily estimates of potentials and runs by fields as of March 16 were announced as follows:

Pool—	Wells	Potential	Runs
Porter	147	113,536	18,852
Yost	10	1,995	645
Greendale	322	4,746	4,746
Vernon	43	4,049	2,619
Leaton	22	748	748
Muskegon	177	491	491
Oceana	14	436	194
Ogemaw	6	523	213
Saginaw	134	134	134
Montcalm	1	32	32
Cass	1	2	3
Total	877	126,606	28,587

Completions

More than 4,000 bbls. of oil and about 750,000 feet of gas was added to the three fields during the past week with one test in a fourth field abandoned. Garfield Oil & Gas Co.'s No. 1 John Clyde Webster, SE NE SE Section 20-13n-1w, Porter Township, was treated with acid. Originally drilled in two weeks ago with a natural flow of 150 bbls. a day, it jumped to 3,550 bbls. setting a new Michigan record of increase. It flowed 165 bbls. in 45 minutes and made 211 bbls. in the first hour from the Dundee topped at 3,389 feet and oil sands at 3,429 feet.

The largest of six other Porter Township wells drilled into the Dundee but not all completed was Stoddard and Darke's No. 3 James M. S. Emery, SW NE NE Section 21, which topped the limestone at 3,373 feet, was drilled to 3,430 feet and flowed at the rate of 550 bbls. a day initial. McClanahan Oil Co.'s No. 1 Densmore, NE SE NW Section 20, drilled 30 feet into the Dundee and was rated good for about 200 bbls. a day with tools stuck in the hole and drilling not yet completed. It will be deepened after fishing out the tools. Northern Oil Co.'s No. 2 Hathaway (permit taken out in the name of William J. Wilson, trustee), NE NE NW Section 18, topped the limestone at 3,404 feet, struck oil at 3,431 feet and was rated at 50 bbls. a day. Same company's No. 3 Hattie M. Hodge, SW NW SW Section 18, topped the Dundee at 3,426 feet and was drilled to 3,449 feet suspending operations to treat with acid with several hundred feet of oil in the hole.

Two other Porter Township wells were drilled into the pay and partly filled the hole with oil before operations were suspended for acid treatment. They were: Fred J. Turner and others' No. 1 Megill, NE NE NE Section 28, which filled 2,000 feet in 30 minutes after striking pay sands at 3,435 feet in Dundee limestone tapped at 3,371 feet and Edward Stewart and Gordon Oil Co.'s No. 1 John McCallum, NE NE NE Section 29. Both are some distance from production.

Gordon Oil Co.'s No. 1 R. Greene, NE NE NE Section 13-13n-2w, Jasper Township, Midland County, which swabbed 60 bbls. in the first 24 hours from Dunee oil sands, jumped to 150 bbls. with treatment. Limestone was topped at 3,395 feet, oil at 3,432 feet and the hole bottomed at 3,457 feet.

Two small gas wells were completed, one in the Michigan series in Broomfield Township and the other in the Monroe formation in the old Muskegon Field. Pure Oil Co. completed No. 1 Alfred F. Skarrit, C SW NE Section 5-14n-6w, an edge well in the Broomfield area, with an open flow capacity of about 600,000 feet a day after a shot. It gauged 500,000 feet before shot.

West Michigan Consumers Co.'s No. 8 Fred Figge, NE NW SW Section 9-10n-16w, Muskegon Township, Muskegon County, a former 10,000,000-foot gasser in the lower Traverse at about 1,875 feet, made about 150,000 feet a day in the Monroe at 2,197 feet. No. 9 Figge in the opposite or southwest corner of the 40-acre lease will be drilled to Monroe immediately.

The latest wildcat of Muskegon Oil Corp., No. 1 William Vandermade, SW SE Section 26-10n-15w, Egelston Township, Muskegon County, is being plugged back to test an oil show in the Dundee between 2,295 and 2,301 feet after striking a light show of oil in the Monroe at 2,437-41 feet. The hole was drilled to 2,458 feet.

Mecosta County

Taggert Brothers, Inc., of Big Rapids, finally gave up attempts to drill by a bit and other steel in their No. 5 M. E. Darrah, C SE NE Section 5-14n-9w, Austin Township, Mecosta County, after reaching a depth of 1,380 feet, or within 10 or 12 feet of the Michigan gas pay in the Mecosta Pool. Rig is moved to a new location. Beginning of construction of a 55-mile natural gas pipe line to Muskegon is awaiting completion by Taggart Brothers of a fifth gasser in the field with at least 4,000,000 feet open flow.

Ogemaw County

Testing of three Ogemaw County wells drilled into the Dundee with prospects of opening a new field at this horizon continued as another was drilled into the upper Traverse formation without success. McClanahan Oil Co.'s No. 1 Frank and Joseph Heintz, NW NW NW Section 24-22n-13, Ogemaw Township, Ogemaw County, which swabbed 70 bbls. after first acid treatment and was estimated for 40 bbls. a day, will be treated again. Pure Oil Co.'s No. 1 Fisk, SE SE SW Section 27-22n-2e, West Branch Township, had 2,000 feet of oil in the hole and was to be treated after core drilling the Dundee and bottoming the hole at 2,807 feet. Dr. C. L. Hess' No. 1 S. W. Richards, or Fisk Brothers, SE SW SW, same section, flowed about 40 bbls. after standing 30 days and will be treated. It is 2,664 feet deep, or 80 feet in the Dundee. McClanahan Oil Co.'s No. 1 Ora Carroll, SW NW Section 29, West Branch Township, is reported running high and nearing the Dundee drilling at about 2,500 feet. Same company's No. 1 O. A. Guilford, NE NE NW Section 29, same township, failed to strike commercial production in the upper Traverse and is drilling at more than 1,800 feet on the way to the Dundee. Half a dozen wells unsuccessful in the Traverse are shut down awaiting the outcome of present Dundee tests. Theodore Oil Co.'s No. 2 Ogemaw Country Club, Section 20, West Branch Township, may be carried to 5,000 feet as a deep test if unsuccessful in the Traverse, Dundee or other formations.

Pure Oil Co.'s No. 2 Willie, C SW NE Section 4-14n-6w, first deep test in the proved Broomfield gas field, is drilling at about 2,400 feet on the way to test the Traverse and Dundee formations.

Wildcat Drilling

A keen interest in wildcatting in widely separated areas of the State is being evidenced, several companies revealing new drilling programs for the immediate future. Pure Oil Co. is reported preparing to start a new western Michigan test in Allegan Township.

Columbia Oil & Gas Co. is building rig for a test on the Dutmers lease in Hinton Township, Mecosta County, northeast of the Austin Township gas pool and

Thirteen Completions in Central West; Two in the Old Lima, Ohio, District

By GEORGE A. WHITNEY
Staff Correspondent, Central West Fields

FINDLAY, Ohio, Mar. 26.—Two completions were reported from the Lima Field. In Wyandot County, Kiner and others' No. 7, 250 feet from the north line and 550 feet from the west line of the Louis Brandt heirs farm, NW Section 34, Crane Township, had an initial production of 25 bbls. from the Trenton lime at a depth of 1,477 feet. In Tymochtee Township, same county, Jones & Coyles' test on the Edith A. Swerline farm, NW Section 21, was dry at 1,482 feet.

In Wood County, Reginal Ryder abandoned Nos. 1, 2, 3, 4, 5, 6, 7 and 8 on the Bryant Brockover farm, Section 26, Freedom Township.

In Sandusky County, Van Vleck-Stowe Oil Co. abandoned Nos. 1, 2 and 3 on the W. H. Keller farm, Section 8, Scott Township.

In Seneca County, four wells are under way: J. H. Murphy and others' No. 1 on the Andrew Kimmett farm, Section 20, Liberty Township; R. E. Greene's No. 3 T. C. and B. G. Shaull farm, Section 30, same township; Horton & Banard's test on the A. D. and M. E. Dondore farm, Section 4, Hopewell Township; and J. L. Barrett's No. 1 T. N. Einsel farm, Section 1, same township.

In Van Wert County, Elmer Caudell has a well starting on the Daniel Staman farm, Section 30, Jackson Township; Ohio Oil Co. is drilling No. 1 Burton farm, same section; and Duncan & Smith have a rig on the W. F. Pangle farm, Section 29, same township.

CENTRAL OHIO

Thirteen completions were reported from the Central Ohio Field, one an oil producer. Hultz-Kundtz, Inc.'s No. 2 on the Charles M. Dawson farm, Section 2, Perry Township, Coshocton County, had an initial of 65 bbls. at a depth of 3,110 feet. In the same township, Preston Oil Co.'s rig is up for No. 4-1,541 on the F. H. Donaker farm, Sections 16 and 17; and Pure Oil Co. is drilling below 2,065 feet on the Roy Hays farm, Section 5, same township.

In Summitt County, East Ohio Gas Co.'s No. 1 on the Ross Lamb farm, Section 17, Green Township, is a gas well at a total depth of 4,169 feet. Wiser Oil Co.'s No. 2 on the Dayton A. Doyle farm, Section 5, Springfield Township, is dry at 3,620 feet.

In Fairfield County, City Natural Gas Works' test on the Julia Boyer farm, Section 9, Pleasants Township, is a gas well at a depth of 2,185 feet. Same company made a location on the Mertz & Moyer farm, Section 14, same township, and has a rig for No. 4 on the Nellie C. Hummell farm, Section 4, Berne Township. Same company is drilling on the Charles Johnson farm, Section 1, Berne Township.

In Knox County, Lacknett and others' test on the William Adams farm, Lot 3, Monroe Township, is a gas well at 900 feet; and Ohio Fuel Gas Co.'s No. 1 J. Winterringer farm, Section 14, same township was dry at 2,701 feet. H. E. Perkins is drilling on the Carl Tucker farm, Section 13, same township, and a test on the Tom and William Moore farm, Section 13, Howard Township.

In Tuscarawas County, Ober Miller and others' test on the E. E. Schwartz farm, Section 4, Fairfield Township, is a gas well at a total depth of 4,859 feet. D. W. Hunt and others' test on the Lessen B. Zimmerly farm, Section 21, Perry Township, is dry. J. H. Harper has a fishing job on the Oscar Kohler farm, Section 22, Jefferson Township; and Oxford Oil & Gas Co. has rig No. 6 on the Thomas B. and Rosie Shearer farm, in the Third-quarter Section, Washington Township.

Belmont County

In Belmont County, George Washmuth and others' No. 2 on the W. C. and Othello Stephen farm, Section 25, Somerset Township, is a gas well at a depth of 1,631 feet. Bradfield and others' test on the Carter Thornburg farm, Section 33, Goshen Township, is dry at 1,227 feet.

In Vinton County, Cashdollar Oil Co.'s No. 1 on the Charles Vanderford farm, Section 2, Elk Township, is a gas well at 955 feet. B. J. Henry is drilling No. 1 on the John C. Sampson farm, Section 2, same township. Kachelmacher Estate is drilling No. 3 on the Lafayette Eggleston farm, Section 30, Brown Township.

In Lawrence County, C. C. Wolfe and others' test on the Pearl D. Pratt farm, Section 14, Union Township, is a gas well at 2,965 feet. Chartiers Oil & Gas Co. made a location on the Dennis Burnett farm, Section 19, Mason Township. R. Schaub is drilling on the Caughlia Hunt farm, Section 35, Windsor Township.

In Geauga County, Brooks Johnson has a rig on the B. W. Eddy farm, Section 7, Chester Township.

In Guernsey County, M. J. Purdy is

(Continued on Next Page)

northwest of the Daily Oil Co.'s Christensen well brought in a discovery upper Traverse oil producer some weeks ago. It is reported A. P. Scheid, an official in the Columbia company, and others have leased a block of about 4,000 acres in this township which they are preparing to test under a unit plan with all of the acreage held under a single lease, the properties pooled by the farmers who will share on the basis of acreage in any oil or gas production discovered.

A new extension test is being started on the Diehl lease, SE NE Section 15, Broomfield Township, by Overnur & Arbaugh, who are building rig about a quarter of a mile southwest of G. W. Olson, Trustee's No. 1 John Fritz, NW NW Section 14, itself an extension project.

Secrecy shrouds the progress of two drilling wildcats in Lincoln and Larkin Townships, Midland County. They are Lawson Oil & Gas Co.'s No. 1 Atkinson, E NE SW Section 21, and Sun Oil Co.'s No. 1 George Piegols, C SW SW Section 9-15n-2e, Larkin Township, both more than 1,200 feet deep but not yet near Traverse.

Permits Issued

The state conservation department issued a permit for another wildcat in an entirely undeveloped section of the State with 14 other permits for wells principally in proved territory in Central Michigan. The new wildcat is to be drilled by Power Oil Co. on the Floyd H. Begole lease, north 25 acres, W half NW Section 31-7n-6e, Flint Township, Genesee County, near Flint. Eight of the 14 other new permits are for Porter Township locations, three in Vernon Township, two in Broomfield and one in Greendale.

The Porter-Midland locations are: C. W. Teater and William R. Kales' No. 1 Frank Neitzke, NW NW NE Section 28-13n-1w; Pure Oil Co.'s No. 1 C. D. Alexander, NW SE SE Section 18; No. 1 James M. Hicks, SW SW SW Section 14; No. 2 A. J. Neitzke, SW NW SW Section 21; No. 3 A. J. Neitzke, NE NW SW, same section, and No. 8 W. Neitzke, NW NW SE Section 21; Sun Oil Co.'s No. 1 William E. Frederick, NW NW SE Section 27, and J. S. Braden's No. 2 J. T. and Hazel McCallum, SE SE SE Section 20.

Three Vernon-Isabella locations were: Mellon-Pollock Oil Co.'s No. 3 Lewis Thayer, SE NE SE Section 22-16n-4w; Garfield Oil & Gas Corp.'s No. 1 J. B. White, NW SW SW Section 24, and Dokenva Gas Corp.'s No. 1-B Elizabeth Walsh, NW NW SW Section 15.

Mutual Oil & Gas Syndicate's No. 1 State, C E half SE NW Section 2-14n-6w, and Guy M. Obenauer, Trustee's No. 1 C SE NE Section 15-14n-6w, are new Broomfield locations, while Leonard Petroleum Co.'s No. 2 H. Woern, NE SE Section 15-14n-2w, Greendale Township, Midland County, completes the list.

J. M. HOLTER DEAD

PITTSBURGH, Pa., Mar. 26.—J. M. Holter, one of the pioneer pipe-liners of the country, died at Newport, Ohio, early Wednesday morning, March 22. He was born at Milton, Northumberland County, Pennsylvania, November 17, 1860. In 1883, he was employed by the Pennsylvania Pipe Line Co. In 1892, Mr. Holter joined the Mellon Pipe Line Co., and in 1903 with the Eureka Pipe Line Co. From that company he was transferred to the South West Pennsylvania Pipe Lines and after 43 years pipe line service in the field, the latter part as gauger in lower Greene County, Pennsylvania, was retired January 1, 1926. Mr. Holter was buried at Mount Morris, Pa.

NEW INCORPORATION

The oil well drilling business formerly conducted by Little & Bell will be continued by a new corporation, Bell & Loffland, Inc., 342 Petroleum Securities Building, Los Angeles, Calif. Cyrus Bell is president, T. S. Loffland, of Loffland Brothers Co., Tulsa, vice president; Neil J. Norris, vice president, and L. J. Whitney, secretary-treasurer.

Central West Fields

(Continued from Preceding Page)

drilling on the Alwin & Carter farm, Section 15, Millwood Township. Jewell & Hammond are drilling on the Frank L. Thompson farm, Section 13, Richland Township. E. C. Quillan and others have a rig in for No. 5 E. C. Quillan farm, Section 10, Wheeling Township.

Stark County failed to report any completions, although there are quite a number nearing the gas-producing area. East Ohio Gas Co.'s No. 2 Charles Pontius farm, Section 16, Plain Township, is drilling below 4,475 feet. Same company's No. 2 on the Canton Cemetery Association's land, Section 20, same township, drilling below 3,800 feet. Same company is drilling below 2,500 feet in No. 7 on the S. H. Sterling farm, Section 27, Hardy Township, Holmes County. Lydic Oil & Gas Co.'s No. 4 William Martin farm, Section 22, Monroe Township, has tools in derrick and shut down. Kanova Oil & Gas Co. is drilling below 1,300 feet in No. 3 Mary A. Beeler farm, Section 20, same township.

Ohio Fuel Gas Co. has a location for No. 1 on the Allis Bay and others' farm, Section 30, Brown Township, Vinton County, and is drilling No. 1 on the D. E. Bolin farm, Section 30, Lodi Township, Athens County, and also made a location for No. 1 W. H. Parmiter farm, Section 11, same township. Same company is drilling No. 10 on the Sunday Creek Coal Co.'s property, Section 34, Carthage Township.

Stark County

The most active development in the Central Ohio Field is Stark County. A late completion, Brendel Producing Co.'s No. 2 on the Canton Suburban Realty Co.'s property, Section 20, Plain Township, is a gas well. Same company is drilling No. 2 William M. Miller farm, Section 4, same township. Hoover Development Co. is drilling No. 2 on the Hoover farm, Section 8, same township, and No. 3 on the Hoover farm, Section 18, same township. Harry W. Hoover has a rig on the M. D. Shanks farm, Section 20, same township. East Ohio Gas Co. has made a location for No. 1 on the Mary Esselbourne farm, Section 4, and has a rig on the William J. Pontius farm, Section 16, same township, and a rig on the John Fasnacht farm, Section 10, same township. This company is drilling No. 1 Frank C. Wise farm, Section 17, and No. 1 on the K. W. Donnenwirth farm, Section 22, also in Olain Township. Wittmer Oil & Gas Co. has a rig on the Violet M. Wise farm, Section 26, Lawrence Township. Robinson & Arn have been delayed in their test on the H. & G. Mellinger farm, Section 9, Plain Township.

McCarnless & Beel are drilling on the Columbus Mutual Life Insurance Co.'s Lot 76, Easton Township, Lorain County. Wittmer Oil & Gas Co.'s test on the Barney O. Rothgery farm, Lot 65, Grafton Township, is reported dry at a depth of 2,375 feet.

In the Cleveland Field, Hulse and others' test on the Emma James farm, Section 28, Olmstead Township, Cuyahoga County, is drilling at 2,425 feet.

In Ashland County, Robinson and others have a rig for No. 7 on the W. S. Wolf farm, Section 18, Lake Township. Ohio Fuel Gas Co. has a location on the B. D. Swope farm, Section 22, Jackson Township.

In Wayne County, Hulse and others have a rig on the F. P. Rice farm, Section 19, Chester Township.

In Licking County, Settles Oil Co. is drilling No. 2 on the Oren B. Evans farm, Section 2, Mary Ann Township; and C. O. Moore is drilling on the Anna Banks farm, in the One-quarter Section, same township. Blue Rock Oil Co. is drilling on the Walter Hoyt farm, Section 17, Perry Township.

Atha Oil & Gas Co. has a rig on the Lyman H. Osborn farm, Section 2, Wayne Township, Muskingum County. McClay Brothers are drilling on the John Merley farm, Section 17, Osnaberg Township, Stark County.

There were no completions in the Illinois, Indiana and Kentucky Fields.

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THE OIL AND GAS JOURNAL

TULSA, OKLAHOMA

Deepening of Splendora Test Still in Progress; Dry Hole in Cleveland District Limits Area

By A. C. EASTERWOOD
Gulf Coast Bureau, The Oil and Gas Journal

HOUSTON, Tex., Mar. 26. — Interest on the Gulf Coast during the past week was still focused on the Splendora area of southeastern Montgomery County, and the Cleveland area in northwestern Liberty County. The deepening of the Splendora test, the dry hole in the Cleveland area, along with the shows encountered below the Cleveland production horizon, added additional interest to the area.

Steen Drilling Co. decided to deepen No. 1 Texas Long Leaf, in the Splendora area, about 7 miles east of the Conroe Field, and explore the formation below its former depth of 5,877 feet, where it showed favorably last week on a drill stem test for opening a new field. It cored 5 feet deeper, recovering only 3 feet of the core which was shale with streaks of sand. Another drill stem test was made from 5,873-84 feet and it built up 575 pounds pressure in 15 minutes and showed one joint of brown distillate. The test was made through a quarter-inch choke on top and three-eighths inch on bottom. Late in the week it was coring below 5,981 feet. A survey of the hole showed the well to be several degrees off and all markers must be corrected upward about 45 feet. It topped the Cockfield 5,814 feet actual or minus 5,683 feet. With a 45-foot correction the Cockfield would be brought up to 5,638 feet subsea.

Cleveland Area

Across the line in northwestern Liberty County, Gulf Production Co.'s No. 1 Grogan, 1,866 feet north of the discovery well in the Cleveland area, was abandoned as dry after reaching a depth of 5,910 feet in black shale. With the abandonment of this well the possibilities of finding production in the Cleveland sand are cut off on three sides. Gulf's No. 1 Grogan to the north, Hamill & Smith's No. 1 Peavey in the Jordan West Survey, about a mile southeast, and Gulf Production Co.'s No. 2 Kirby to the south. Brown & Wheeler's No. 1 Golberg, about 1½ miles to the southwest also failed to find production in the Cleveland sand. The discovery well, Gulf Production Co.'s No. 1-C Kirby, completed last December, so far is the only production for the field. It had sand topped at 5,716 feet with bottom at 5,732 feet in shale.

Gulf Production Co.'s No. 2-C Kirby, south of the discovery well, late in the week was coring 7,218 feet. It encountered sand with an odor of oil 7,175 feet and another faint odor of oil in sandy shale at 7,198 feet, which are probably the Cook Mountain. Gulf has staked a location for No. 3 Kirby southwest of the discovery well in the direction of Brown & Wheeler's No. 1 Golberg dry hole. The test will be drilled 7,100 feet south and 1,183 feet west of the northwest corner of John Pleasant Survey.

In Liberty County and about 7½ miles northeast of the Cleveland area, Denton & Akin's No. 1 B. E. Quinn made a six-minute drill stem test from 5,477-5,561 feet which showed 3 thribbles mud, with no pressure, through quarter-inch chokes on top and bottom. Late in the week it was reaming to bottom to make another test. Total depth is 5,576 feet. This test topped the Hockley at 4,640 feet actual or 4,471 feet subsea. About 4 miles southeast of the Cleveland activity, Wilcox Oil & Gas Co.'s No. 1 Cousins was abandoned as dry with total depth of 6,030 feet. This well topped the Discorbis at 3,946 feet and encountered top of Heterostegina 4,000 feet. Surface elevation is 59 feet. West of the Wilcox dry hole, Turnbull & Irwin and others' No. 1 Hildebrandt was rigging up. It is about 12 miles north of Dayton, in the W. Whitlock Survey.

Matagorda County

Of great importance the past week were results of a drill stem test which established fairly definitely the existence of a new producing area around Skelly Oil Co.'s No. 1 Cobb in Matagorda County, on the Van Vleck geophysical prospect. On a drill stem test in sand from 7,026-45 feet it showed a large amount of 56 gravity distillate through an eighth-inch choke, and is estimated good for 25,000,000 to 50,000,000 feet of gas. It had an equalized pressure of 2,550 pounds. Distillate has changed from water white to considerable coloration. Operators were installing a high-pressure separator and tanks before running a series of tests. Total depth is 7,076 feet where it has been plugged back from 7,178 feet. Skelly Oil Co. had some geophysical work done in this area last July and the block lies just north of the old Van Vleck prospect.

At Sheppards Mott, in Matagorda County, Oils Consolidated has set a string of casing in No. 2 Hawkins in an effort to overcome the heaving shales encountered in this area. No wells have drilled through the heaving shale and only one well was completed as a producer, but it flowed only for a few hours at the rate of about 300 bbls. daily and then quit flowing. The 9⅝-inch casing was cemented at 5,358 feet and late in the week was waiting on cement to set. At Buckeye in Matagorda County, United North & South Development Co.'s No. 1, Unit 6, was coring at 8,190 feet. After it had reached a depth of 9,257 feet the hole heaved to around 6,700 feet and it is now redrilling.

In the Greta Field, in Refugio County, two wells were completed during the past week, Blanco Oil Co.'s No. 4-A J. J. O'Brien was completed for 8 bbls. per hour at 4,400 feet, and Atlantic Oil Production Co.'s No. 3 J. J. O'Brien bottomed hole at 4,391 feet and flowed at the rate of 121 bbls. of oil daily through an eighth-inch choke. At the north end of the field Humble Oil & Refining Co.'s No. 1 Welder had missed the 5,900-foot pay horizon and was drilling at 6,350 feet in shale. This well probably marks the north end of the field. Humble Oil & Refining Co.'s No. 11 O'Connor, in the O'Connor Field, was completed for 80 bbls. daily after it had reached a total depth of 3,196 feet. It is reported the Greta Field now has 20 wells in the field making water. Many wells have cased off the upper sand and are producing from the lower sand where the encroachment is coming from.

Fort Bend County

In Fort Bend County, Quintana and others' No. 2 Wood, O'Connell & Mellon, a wildcat, on a drill stem test during the past week from 6,285-6,305 feet made 1,600 feet of mud and 2,250 feet of salt water in 10 minutes. It will probably be abandoned.

Brazoria County

On the Pearland prospect in Brazoria County, West Len Oil Co.'s No. 1 Settegast in the W. C. D. Hall Survey, was abandoned the past week after it had reached a depth of 6,296 feet.

Hardin County

Of interest was the showing of oil encountered in Parr and others' No. 1 Benard, west edge well at Sour Lake in Hardin County, which may prove a new producing sand for the area. It had sand with a show of oil and gas from 6,936-44 feet. The 7-inch casing has been cemented at 6,886 feet and is now waiting on cement to set before testing. Deepest production at present at Sour Lake is around 4,300 feet.

Harris County

On the Bammel prospect north of Houston, Harris County, American Liberty Oil Co.'s No. 1 Clappert, was drilling below 5,615 feet in shale. It encountered top of the Hockley at 5,375 feet actual or 5,258 feet subsea. According to some of the company geologists it is considered running high. It topped the Vicksburg at 4,495 feet. McCarthy and others' No. 1 Preston, a wildcat in the William Jones Survey, was drilling at 4,725 feet. Texana Oil Co.'s No. 1 Gore, in the Sarah McKissick Survey, was abandoned as dry with total depth of 6,262 feet. At Hockley, in Harris County, Deering's No. 5 Warren was abandoned at 1,590 feet. It encountered top of the salt at 1,543 feet. In the Tomball area of Harris County, Humble Oil & Refining Co.'s No. 2 L. B. Moody bottomed hole at 5,600 feet and was completed for 7 bbls. per hour through a quarter-inch choke, 3 per cent of which was salt water and mud. It was making 1,982,000 feet of gas.

The deep sand production in the Goose Creek Field of Harris County marked its third deep sand completion during the past week when Sun Oil Co.'s No. 9 Wright came in flowing at the rate of 290 bbls. daily through open tubing. Total depth is 4,550 feet.

Wharton County

Pure Oil Co. completed its No. 1 Isaac Weaver at Louise in Wharton County during the past week. The well was drilled to 6,455 feet and set 15 feet of 5-inch screen, where it has been completed flowing at the rate of 112 bbls. of 62.4 gravity oil per day through three-eighths inch choke. Tubing pressure was 1,885 pounds and casing pressure 1,075 pounds. Pure's No. 1 A. J. Wilder has been temporarily abandoned at 4,000 feet.

On the Leech prospect in Wharton County, Texas Gulf Production Co.'s No. 1 Lurker has been junked and abandoned at 3,865 feet, where it was sidetracking. Total depth of the hole was 5,026 feet. This test was started in the latter part of 1932 by Steed Production Co., then Nabors and others attempted to carry it down, and finally Texas Gulf Production Co. took it over. Texas Gulf Production Co. is now doing some geophysical work in the area, after which it will stake another location for a test.

Jackson County

In Jackson County, Ed Parsons and others' No. 1 Clark, in the A. S. White Survey, has been abandoned as dry at 5,377 feet in sandy shale. This test topped the Vicksburg at 4,135 feet and encountered top of the Hockley at 4,942 feet.

Liberty County

The Jackson sand at Hull in Liberty County marked up another producer to its credit during the past week when Humble Oil & Refining Co.'s No. 36 Guedry came in flowing at the rate of 37½ bbls. an hour through a three-eighths inch choke. Tubing pressure was 550 pounds and casing pressure 1,250 pounds. Total depth is 5,027 feet. The Jackson sand has been getting consider-

Gulf Coast Fields and Wildcats

Week Ending March 24

DAMON MOUND—BRAZORIA COUNTY

Company, farm and location—	Remarks:
Intercoastal Oil Co.'s No. 11 Wisdom, 350 ft. E of No. 6, Blk. 51, Lot D, A. Darst Sur.	T.D. 2,652 ft.; flowed 190 bbls. fluid, 50% water; packer stuck 32 ft. off bottom; milling.

MANVEL—BRAZORIA COUNTY

Burton Drlg. Co.'s No. 1 Parker, 40 ft. E and 70 ft. S of SW cor. of Lot No. 28, H.T.&B. Sur. No. 63	Location.
Texas Co.'s No. 9-B Belcher, 2,691 ft. N 42 deg. E from S cor. H. N. Little Sur., and 330 ft. NW at R/A from survey line	Drlg. gumbo 2,203 ft.
Texas Co.'s No. 1 Boff, 265 ft. from S and 325 ft. from W line of C of Lot 24, H.T.&B. Sur. No. 74	Rigging up.
Texas Co.'s No. 4 O. F. Ewing, 415 ft. from NW line, Lot 8, and 787.2 ft. from NE line, H. N. Little Sur.	T.D. 5,850 ft.; sidetracking at 3,900 ft.
Texas Co.'s No. 2 Scopal, 200 ft. N and 200 ft. W from SE cor. of lease	Location.
Turnbull & Irwin's No. 1 Marachini, 300 ft. from NE line and C of E and W lines of 5-acre tract in C. O'Donnell Sur. No. 492	Drlg. 2,800 ft.

STRATTON RIDGE—BRAZORIA COUNTY

Amerada Pet. Corp.'s No. 5 Seaborn, Austin-Williams Sur., 600 ft. E of No. 3 and 329 ft. S at R/A	Preparing to drill plug; T.D. 5,566 ft.

WEST COLUMBIA—BRAZORIA COUNTY

Miramar Oil Corp.'s No. 1 Hogg, Martin Varner league (second hole), 75 ft. N of first hole	Drlg. shale 3,200 ft.

BARBERS HILL—CHAMBERS COUNTY

Mills Bennett Prod. Co.'s No. 1-D Barber, 75 ft. S, 65 ft. W of NE cor.	Shale 4,792 ft.; cmtd. back to 3,764 ft.; top oil sand 3,873 ft.; T.S. 4,425 ft.; T.D. 4,441 ft.; preparing to set casing.
Humble O. & R. Co.'s No. 5-B Kirby, Henry Griffith League, 928 ft. W of E line, 537 ft. N of S line of tract	Top salt 1,620 ft.; drlg. salt and shale 5,270 ft.
McAlbert Oil Co.'s No. 3 Wilburn, Henry Griffith league.	O.T.D. 5,317 ft.; T.D. 5,215 ft., sand; swabbing.
Sinclair Prairie Oil Co.'s No. 15 Wilburn, Henry Griffith League, 150 ft. W of No. 14	Oil sand 4,830-70 ft.; swabbed fresh water; no oil; T.D. 3,898 ft.; W.O.C.

(Continued on Page 154)

able activity on the south flank of the Hull Field lately.

Conroe Field

Five completions were added to the Conroe Field during the past week, four oil producers and one dry gasser. The gas well was Gulf Coast Drilling & Producing Co.'s No. 14 Keystone Mills which was completed at 5,149 feet. Humble Oil & Refining Co.'s relief well, No. 1-H Alexander, scheduled to go on production this week, flowed for one hour and then went dead.

SOUTH LOUISIANA

A new producing horizon may be opened in the Lockport Field in Calcasieu Parish by Union Sulphur Co.'s No. 1 Farquahar, in the west extension area of the field. It was drilled to a total depth of 7,702 feet and has since been plugged back to 7,468 feet where the well has made several efforts to blow out while operators were attempting to set screen. Screen had been set and late in the week it was swabbing. If this sand proves productive it will open the deepest producing horizon in the field. At present the deepest production is coming from 6,706 feet which is Yount Lee Oil Co.'s No. 1 Miller, also on the west side of the field. In the Gillis area, Union Sulphur Co.'s No. 1 Barbe estate was drilling at 8,072 feet in sandy shale.

At East Hackberry in Cameron Parish, Texas Co. encountered a hard sandy lime showing oil in No. 11-B State, which may prove a new productive horizon for the northeast extension district of the field. The horizon is similar to that opened by the Union Sulphur Co. on the Humble lease on the northwest flank of the field. It topped the formation showing oil at 6,078 feet and cored to the present depth of 6,092 feet. A string of 7⅝-inch casing was set and cemented at 6,026 feet and late in the week was drilling plugs and preparing to run screen.

In Acadia Parish and near the eastern boundary of Jefferson Davis Parish, Mills Bennett's No. 1 Riverside Irrigation has been abandoned at 7,602 feet. The hole was junked, leaving 35 joints of drill stem stuck in the hole.

Roanoke

In Jefferson Davis Parish at Roanoke, Humble Oil & Refining Co.'s No. 2 De-Vilbiss has plugged back to 7,781 feet and late in the week was preparing to swab. Pipe was perforated from 7,691-7,720 feet. If this test fails one more plug back will be made before abandoning the well. This test was formerly carried to a total depth of 8,423 feet. About a mile southeast of the above well, Shell Petroleum Corp.'s No. 1 Kratzer had reached a total depth of 7,527 feet and was reaming to set a string of 9⅝-inch casing in order to carry the well deeper.

George W. Strake's No. 1 Fred Pedigrew, about 1¼ miles east of the Iowa Field, has been abandoned as dry at 7,348 feet. In the Iowa Field, Barnsdall Oil Co.'s No. 2 Fontenot bottomed hole at 6,994 feet and has been completed for 1,550 feet daily through twenty-four-sixty-fourths inch choke. Tubing pressure was 1,200 pounds and casing pressure 1,500 pounds.

In LaFourche Parish, Barnsdall Oil Co.'s No. 1 Harang has been abandoned as dry with total depth of 7,190 feet in salt. It was plugged back from 7,190 feet to 2,214 feet in an attempt to find production in the shallower formations but failed.

At Four Island Bayou in Terrebonne Parish, Texas Co.'s No. 2 State has been abandoned with total depth of 6,740 feet. At Gueydan in Vermillion Parish, Pure Oil Co.'s No. 5 Mulvey, southeast of production, was abandoned with total depth of 5,862 feet in salt.

Lease play throughout the southern part of Louisiana is still very active and shows no signs of abating.

GULF OIL CORP. REPORT

PITTSBURGH, Pa., Mar. 26. — Gulf Oil Corp.'s annual report for 1933 reported a net loss of $11,386,387, compared with a net profit of $2,743,492 in 1932. The company showed a profit for the last seven months of the year.

Special Devices Feature of Houston Exposition

With most of the exhibiting space within the main building being contracted for, plans for special features are being enlarged for the fifth annual Oil Equipment and Engineering Exposition to be held in Houston, Tex., April 16 to 21, inclusive. Tools and machinery for all branches of the petroleum industry will be on display but demonstrations of the application of equipment will also be given to show the adaptability of new devices for drilling and production, for refinery and gas plant installation, for pipe line and other transportation and for the marketing of refined products.

According to E. G. Lenzner, general manager of the exposition, a great many of the visitors will come from other oil-producing areas of the United States and from foreign countries. Both the methods and equipment in use in the Gulf Coast and other Texas fields are attracting the interest of operators everywhere.

Arrangements have been made for reduced railroad fares both by the identification certificate plan and by lower daily round trip fares. The identification certification plan fares have been authorized by the southwestern carriers on a basis of fare and one-third on the new fares in effect December 1, 1933. These fares and arrangements have been tendered to all connecting associations. Arrangements for associations such as the Independent Petroleum Association of America have already been made since their programs have been specifically provided for.

In addition to the round trip identification plan fare, first class round trip tickets will be on sale daily between all points west of Chicago, St. Louis, Memphis, Vicksburg and New Orleans on a basis of 2 cents per mile in each direction. Also, round trip coach fares on a basis of approximately 1.8 cents per mile in each direction will be sold.

Additional space has been secured for the exposition, including a large tract in front of the Convention Hall, which will enable the exhibitors who have displays of tools and machinery within the building to demonstrate the performance of their equipment under conditions similar to those in the field and plant.

CALIFORNIA PRODUCTION MEET

LOS ANGELES, Calif., Mar. 24.—The California district of the A.P.I. Production Division will hold its spring meeting and informal dinner at 6:30 p.m., Wednesday, April 4, 1934, at the Jonathan Club, Los Angeles. In addition to election of district officers and members of the advisory committee, three papers, all illustrated by slides, will be presented:

"The Present Economic Outlook of Russia," by Lester C. Uren, professor of petroleum engineering at the University of California.

"Application of Electrical Coring and Correlation in California," by Frank W. Lake, petroleum engineer, Los Angeles.

"The Effect of Curtailment on Drilling and the Maintenance of Company Position," by R. E. Allen and William Hight of the umpire's office. To be presented by Mr. Allen, assistant oil umpire.

R. BRUCE DUNLOP DIES

SARNIA, Ontario, Mar. 24.—R. Bruce Dunlop, retired official of Imperial Oil Refineries, Ltd., and for many years active in the Canadian oil industry, died here on March 20, aged 62. Death followed an emergency operation. Mr. Dunlop was a native of Petrolia, where he joined the staff of Canadian Oil Cos., Ltd. Later he was transferred to Imperial Oil, Ltd., at Sarnia. In 1914 he was transferred to Peru with the International Petroleum Co., first as superintendent of the refinery at Talara and later as manager. After 15 years there he retired in 1929 and took up his residence in Sarnia.

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Test May Mean Important Lea Pool Extension; More Wells Are Drilling in Colorado District

By TOLBERT R. INGRAM
Staff Correspondent, Rocky Mountain Area

DENVER, Colo., Mar. 26.—The Texas Co.'s No. 2-B Lynch, three-fourths of a mile ahead of production in the Lea Pool, New Mexico, is flowing 10 bbls. per hour while drilling deeper and may mean an important extension of the pool. Same company's No. 2 Moberly, in the Jal Pool, stopped to test at 3,198 feet and flowed 288 bbls. of oil and 6,500,000 feet of gas in 24 hours. The Tide Water Oil Co. made a location in the Eunice Pool, bringing the number of operations in that area up to three. Hobbs potential was increased by 218,969 bbls. daily on March 16, due to establishment of new potentials on a number of wells. Leonard & Barnsdall's No. 1 State, in Eddy County, was completed as a small gasser.

Colorado operations showed more wells drilling the past week and advices from Washington regarding extension of permits promise to result in a further increase in activity.

Midway Oil Corp.'s deep test on the Midway Dome in Wyoming cored the second Wall Creek and found it saturated. One completion, a 40-bbl. well, and one new location were reported in Osage. Several wildcats shut down for the winter are resuming.

Two completions, both average wells, two near completions and two new locations were reported in the Cut Bank Field in Montana.

NEW MEXICO

Lea County

The Texas Co.'s No. 2-B Lynch, C SE SW Section 27-20-34, a semiwildcat north of the Lea Pool, may open up an important extension of that field and result in a revision of the geology of that area. At last reports it was drilling at 3,639 feet in lime and flowing 10 bbls. per hour from 3,622-33 feet. It is a little less than one-half mile east of No. 1 Flint, SE cor. Section 28-20-34, which was abandoned by the Marland Oil Co. in 1929 at a total depth of 3,750 feet. No. 1 Flint was supposed to have been drilled along the axis of the structure, which Dean E. Winchester described in his report as a gently plunging, but steep-sided nose, which plunges to the southeast. The nearest producer is the Texas Co.'s No. 1 Lynch, NW cor. SE Section 34, three-fourths of a mile to the south and a little east of No. 2-B Lynch. This was the pool's discovery well, completed for 1,000 bbls. initial, at 3,731 feet, in April, 1929. Between No. 1 Lynch and No. 1 Flint, the Texas Co.'s No. 1-B Lynch, C SW SW Section 34, was dry and abandoned. The Lea Pool proper is to the southeast of the wells mentioned, mostly in Sections 1 and 2-21-33.

The Texas Co.'s No. 1 Lea, SW cor. NW Section 14-20-34, nearly 3 miles to the north, is shut down at 1,200 feet in the red beds.

In the Jal Pool, Western-Anton's No. 1 Conditt, C SW SW Section 12-25-36, a recent completion, has been put on production and made 900 bbls. of oil and 6,000,000 feet of gas the first 24 hours, through a choke. It topped the Terry at 3,200 feet, and total depth is 3,373 feet. Its elevation is 3,170 feet.

The Texas Co.'s No. 2 Moberly, C NW SE Section 8-26-37, which tested 9,000,000 feet of gas at 3,191-98 feet, had an increase in gas at 3,249 feet, and is coring in black lime at 3,339 feet. It was tested at 3,272-85 feet and flowed 288 bbls. of oil and 6,500,000 feet of gas first 24 hours and 144 bbls. and 6,800,000 feet in the second 24 hours. The Stanolind Oil & Gas Co.'s No. 29-B Farnsworth, C SW SW Section 7-26-37, is building rig and drilling water well. Empire Gas & Fuel Co.'s No. 1-B Lindley, C SE SW Section 13-25-36, is waiting after cementing the 9⅝-inch at 2,745 feet with 300 sacks, and the Barnsdall Oil Corp.'s No. 1 Forrest, NE NW SW Section 24-25-36, is waiting after cementing the 9⅝-inch at 2,930 feet with 400 sacks. Total depth of last named is 2,944 feet. Continental Oil Co.'s No. 24-A No. 1 Ascarate, C NW NE Section 24-25-36, is drilling at 2,884 feet in lime.

A new location in the Eunice area is the Tide Water Oil Co.'s No. 2 Coleman, C NW NE Section 17-21-36, half a mile to the south of the Atlantic Producing Co.'s No. 1-B State, and one-third of a mile north of its No. 1 Coleman, both producers. Continental Oil Co.'s No. 8-A No. 1 A. E. Meyers, C NE SW Section 8-21-36, is rigging up rotary, and the Atlantic Oil Producing Co.'s No. 2-B State, C NE SE Section 8-21-36, is rigging up rotary.

In the Hobbs Pool, Noble Brothers' No. 1 Shell-State, SE cor. NW Section 24-18-37, cemented the 7-inch at 3,930 feet with 150 sacks, and is waiting. The Empire Gas & Fuel Co.'s No. 4 Fowler, NE SE NE Section 31-18-38, cemented the 12½-inch at 242 feet with 100 sacks, and is waiting, and the Stanolind Oil & Gas Co.'s No. 6 Turner, NW cor. Section 34-18-38, is shut down for orders without spudding.

Eddy County

Leonard & Barnsdall's No. 1 State, SW cor. Section 21-17-29, in the Jackson area, was completed as a gas well after plugging back from 3,004 feet to 2,300 feet. Initial production was 1,750,000 feet per day.

R. D. Compton's No. 2 Compton, CNL NW NE Section 8-18-27, Artesia area, for which location was released in June, 1933, is rigging up rotary. Van Welch, Jr., and others' No. 2 State, SW NW NW Section 22-17-28, is drilling at 793 feet in gypsum and red beds, and Flynn & Yates' No. 69 State, NW SE SE Section 10-19-28, is drilling at 870 feet, with the 8¼-inch at 615 feet.

Grayburg Oil Co.'s No. 5 Burch, C SW NE Section 19-17-30, Maljamar area, is drilling at 2,515 feet in gray lime, and Repollo Oil Co.'s No. 2-X Parke, NE NW NW Section 23-17-30, is drilling at 3,437 feet in gray lime. The last named is an old well drilling deeper from 3,419 feet, at which depth it was completed in 1930 with an initial production of 134 bbls. first 24 hours, by Lockhart & Co.

Ralph Spearow and others' No. 1 McClelland, SW NW NE Section 22-22-23, western Eddy County, has pumped down to 3,246 feet at which depth it is making 2 to 3 bbls. of heavy black sulphurous oil per day.

San Juan County

Fred Barrett's No. 1 Hart, SW NW SW Section 11-29-11, Aztec district, is reported showing considerable gas and some oil at 1,685 feet, corrected total depth, and is trying to shut off water. The gas cleaned the hole. Jack Amenda and others' No. 1, NE SW Section 25-30-12, is drilling at 200 feet.

San Miguel County

Starr-Kennedy Oil Co.'s No. 1 Adams, NE cor. Section 25-17-16, Graham district, is reported to have sidetracked collapsed pipe to bottom at 5,093 feet and to be straightreaming at 4,985 feet to run the 5⅞-inch. Same company's No. 1 Sanguijule, NE SE Section 18-17-17, topped the Dakota at 304 feet, where it had a show of oil, and is shut down at 307 feet. Its objective is a sand expected at 2,000 feet.

Santa Fe County

Elmer Fisher's No. 1 Hill, Section 6-10n-7e, Barton district, is reported 10 feet in a brown sand at 1,520 feet, with a show of oil. C. C. Ownes and others' No. 1 Cantwell, NW cor. Section 5-10-9e, is running the 15½-inch at 250 feet, total depth.

Hobbs Proration

Proration schedule for the Hobbs Pool as of March 16 gives the potential as 1,549,821 bbls. daily from 184 units, an increase of 218,969 bbls. as compared with March 1. Increase is due to the establishment of new potentials, and taking into consideration increases in wells treated with acid.

COLORADO

Announcement from Washington that there will be no change in policy by the Department of the Interior regarding extension of permits on the public domain has served to relieve a tense situation in all of the public land states. Nathan R. Margold, solicitor of the department, advised Senator O'Mahoney, of Wyoming, that all cases involving extension of oil and gas permits, which have been held in abeyance pending determination of the underlying question of policy, now will be disposed of as speedily as possible in substantial accordance with the practice heretofore followed.

It had been reported that the department was considering a change in regulations which would require permittees who had not made discoveries to waive the right to lease one-fourth of a permit at a royalty of 5 per cent before permits would be extended. A large number of permits about to expire had not been renewed and considerable proposed drilling on the public land was held up awaiting the outcome of the applications for extensions. The announcement that no change in policy will take place is ex-

Important Extension of Light Crude Oil Area Indicated in South Turner Valley

BY VICTOR LAURISTON
Staff Correspondent, Canadian Fields

CHATHAM, Ontario, Mar. 24.—An important extension of the producing area of South Turner Valley is indicated by the striking of commercial light crude oil production in the Dalhousie sand in Highwood-Sarcee Oils' No. 1, LSD 16, Section 21-18-2w5. The test is the farthest south venture now drilling, and some distance south and a little east of the naphtha producers in Section 28. It got the pay sand at 5,046 feet and continued drilling to 5,075 feet. During the night oil seeped rapidly into the hole and by morning it was flowing over the top of the casing. Later it started to flow by heads at intervals of 15 to 30 minutes. The gas flow has been estimated around 2,000,000 feet a day. The oil is a light amber crude of good grade and will test around 51 gravity or better, being similar to the light crudes encountered in Turner Valley tests in various horizons above the Madison lime.

At last reports the hole was being got in shape to deepen. It is believed there are 25 feet more of pay in the Dalhousie. The well is estimated good for a flush production of at least 200 bbls. a day.

Highwood-Sarcee Oils, Ltd. is headed by A. W. Dingman, the veteran Calgary oil producer whose Calgary Petroleum Products Co. 20 years ago drilled the No. 1 Dingman discovery well which got the first light crude production in Turner Valley. No. 1 Dingman started the first Calgary boom. Mr. Dingman continued active in the field long after the collapse of the boom, until his original company was merged in the present Royalite Oil Co., which late in 1924 got the first naphtha production in the Madison lime. Later he organized Highwood-Sarcee Oils, Ltd., No. 1 test being started last summer. Discussing the present strike, Mr. Dingman said:

"Of course we have been getting flush production, but the well looks most encouraging. When things settle down a little we will drill deeper into the sands and test out their depth and the volume of oil. Then we will take production and when and if this decreases greatly we will drill on to the limestone."

The nearest producer is Mar Jon-Freehold's No. 1 in Section 28-18-2w5, which, however, is a naphtha producer from the Madison lime. Fair commercial production of light crude has previously been encountered in a number of horizons overlying the lime, notably in the McDougall-Segur and McLeod sections of the central field and the Home section of South Turner Valley. The first light crude production in South Turner Valley was struck by Dalhousie Oil Co.'s No. 5, LSD 16, Section 30-19-2w5, in a horizon of the lower Blairmore at 4,810 feet, drilling being continued through the Kootenay into the top of the Fernie shales. This horizon has since been known as the Dalhousie sand. This well has been one of the steadiest light crude producers in the field, holding up far better than the upper sands. Light crude has also been encountered in the dolomitic limestone in a few wells on the west side of the structure, though those on the east side are uniformly naphtha producers in the lime horizon.

Highwood-Sarcee's No. 1 was drilled

(Continued on Page 146)

pected to be followed by extensions and more activity in wildcatting.

Fremont County

John Miller and others' No. 1, SW SE SE Section 30-18-69, Florence district, is drilling at 900 feet in black shale, and the Waterville Oil Co.'s No. 1 State, SE cor. NW Section 16-18-69, Phantom Canon, is drilling at 2,500 feet in red shale and lime, presumably the Morrison formation. This is a test to the Pennsylvanian.

Montezuma County

McElmo Oil Co.'s No. 1 West, NE NW NE Section 31-36-17, McElmo district, is drilling at 1,700 feet.

Park County

South Park Oil Co.'s No. 1 Milligan, NE cor. SE Section 13-8s-76, Jefferson district, is drilling at 3,210 feet in arkose.

Larimer County

Eastman & Deininger's No. 1 Cement, NE SE NW Section 30-5n-69, Loveland district, is drilling at 374 feet with a show of oil and believed to be near the objective Muddy sand.

Moffat County

Stanolind Oil & Gas Co.'s No. 32 Parkinson, Lot 6, Section 23-4n-92, Iles Dome, is drilling at 1,100 feet.

WYOMING

Carbon County

Earl W. Reeder, Inc.'s No. 1 Union Pacific, C SW SW Section 19-20-83, Overland Dome, which has found the objective sands much deeper than at first expected, is drilling at 4,225 feet and is through the first Muddy sand, which was topped at approximately 4,120 feet, and is drilling toward the second Muddy, with the true Dakota at around 4,300 feet as the main objective. There was some oil in the first Muddy and the quantity in the hole increased from 2,500 to 2,700 feet.

Ohio Oil Co.'s No. 1 A. J. Hazlett, NE NW Section 34-23-79, Allen Lake, cemented the 6⅝-inch at 2,010 feet after plugging back to the Sundance from 4,083 feet, and will complete as a gas well.

Natrona County

Midway Oil Corp.'s No. 1 Boyer, SW NE NE Section 23-35-79, Midway Dome, cemented the producing string on top of the second Wall Creek at 5,118 feet. Cores taken from the second Wall Creek showed saturation. The sand was found approximately 30 feet higher than in the discovery well.

Converse County

Wyoming Southern Oil Co. and S. H. Keoughan's No. 1 Wisda, near C Section 27-32-69, Shawnee structure, has resumed drilling at 950 feet after testing show of gas at 665 feet. E. B. Jones and others' No. 1 State, C NE NW Section 27-32-69, is spudding in a 24-inch hole with cable tools.

R. J. Dilger and others' No. 1, NE cor. SE Section 32-31-72, Poison Lake, had a show of oil at 1,010 feet and stopped to cement pipe on bottom.

White Rock Oil Co.'s No. 1 Douglas Land Co., NE NE Section 32-32-71, Douglas district, is spudding. The location is just west of same company's No. 1 Silver, NW NE Section 33-32-71, which was completed recently at 128 feet for 600,000 feet of gas with a pressure of 21 pounds.

Park County

Frannie Oil Co.'s No. 2 Northern Pacific, SE SW SE Section 23-68-98, Frannie Field, set the 12½-inch at 371 feet, and Stanolind Oil & Gas Co.'s No. 21 Rosenberg, NE SW NE Section 26-58-98, is drilling at 1,587 feet.

Niobrara County

Interstate Oil & Refining Co.'s No. 1 Morrell, NW NE SE Section 2-39-61, West Mule Creek, is drilling at 2,575 feet. The well showed considerable gas and drilling was suspended until a control head could be installed. There was a show of light oil in the bailer. The formations on the west dome lie several hundred feet higher than on the east dome, where the Argo Oil Co. made a discovery in the Minnelusa several years ago in the only test drilled to that horizon.

Weston County

Wyoming Oil & Gas Co.'s No. 4 Logan McCullough, SW NW NE Section 23-46-64, Osage Field, swabbed 40 bbls. first 24 hours from sand at 1,754-64 feet, after a shot. C. L. Nichol's No. 4, SE cor. NW Section 8-46-63, an operation not heretofore reported, is spudding. The West Osage Oil Co.'s No. 3, SE NE Section 15-46-64, is rigging up.

Hot Springs County

California Exploration Co.'s No. 1, NE SE NE Section 12-44-97, Waugh Dome, a test to the Tensleep at 4,100 feet, is spudding. It will be drilled with cable tools. Empire State Oil Co.'s No. 4 Republic, NE cor. NW Section 14-44-98, Hamilton Dome, was completed for 100 bbls. per day, initial production, at 2,853 feet, total depth, from the Tensleep at 2,810-22 feet. This is the second well in the field completed in the Tensleep, the other producers being in the Embar. The oil from the Tensleep is 14.3 gravity and of asphaltic base.

Big Horn County

W. O. Taylor and others' No. 1 Hoskins, Lot 5, Section 25-56-97, Byron district, which was showing for 500,000 feet of gas and 6 bbls. of 56 gravity oil per day when operations were suspended at 2,376 feet for the winter, is resuming and running the 10-inch casing. Torchlight Oil Corp.'s No. 1, SW cor. SE Section 19-51-92, Torchlight district, is resuming at 4,020 feet, to which depth it was plugged back from 4,068 feet to shut off water, and is fishing for tools.

Lincoln County

Superior-Wyoming Oil Co.'s No. 1-A Government, SW NE NW Section 3-26-113, La Barge district, is drilling at 650 feet.

MONTANA

Glacier County

Two completions and two new locations were reported in the Cut Bank Field. Santa Rita Oil & Gas Co.'s No. 1 Whetstone, Lot 8 (SE SE SE) Section 27-35-6w, swabbed 60 bbls. first 24 hours from sand at 2,892-2,918 feet. Total depth is 2,920 feet. Pumping equipment is being installed.

The Texas Co.'s No. 1 Yunck, W NW SW Section 14-35-6w, was completed at 2,895 feet and is on production from sand at 2,851-83 feet. It pumped 25 bbls. first four hours and will make a good well.

The two locations are R. C. Tarrant's No. 1 Jones, C SW SE Section 31-34-5w, and the Santa Rita Oil & Gas Co.'s No. 1 Hardy, C Lot 5 (NW NE) Section 27-35-6w. The last named has rig on location.

R. C. Jeffries and others' No. 1 Clark, C SW SW Section 3-34-6w, an outside well on the northwestern side of the field and half a mile out from the nearest producer, is a near completion. It is drilling in sand at 2,966 feet with 1,200 feet of oil in the hole.

Alberta-Pacific Consolidated Oil Co.'s No. 3 Kiesel, NW cor. Section 11-34-6w, is another near completion. It cored a saturated sand at 2,874-79 feet and stopped to run the 6⅝-inch to 2,872 feet.

A. B. Cobb's No. 2 Walburger, C NW SE Section 35-35-6w, is drilling at 2,310 feet, and the Dakota-Montana Oil Co.'s No. 1 Gilham, C Lot 4 (C NW NW) Section 3-34-6w, is drilling at 580 feet. Last named topped the Colorado at 540-45 feet. Dunstall and others' No. 1 Kennerly, E NE NW Section 22-34-6w, is drilling at 2,877 feet, and the Montana Headlight Oil Co.'s No. 2 Williams, C NE NE Section 11-34-6w, is drilling at 2,075 feet.

Montana Power Gas Co.'s No. 1 Neill, C NE Section 20-33-5w, in the South Cut Bank area, is drilling at 205 feet, and its No. 2 Seeba, E half E half NW Section 2-34-6w, is drilling at 2,100 feet. Nyhagen-Bell's No. 2 Anderson, NW cor. SW Section 26-35-6w, is a location, and Nadeau Brothers' No. 2 Van de Mar, SW NW Section 35-35-6w, spudded March 16. Par Oil Co.'s No. 2 Haines, SE cor. SW Section 2-34-6w, is fishing for tools at 2,840 feet.

Producers Development Syndicate's No. 1 Eniarson, SW NW NW Section 29-32-4w, South Cut Bank, is fishing for bailer at 2,040 feet and making a little water at 1,880-95 feet.

Santa Rita Oil & Gas Co.'s No. 3 Cardwell, E SE NE Section 15-35-6w, is

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rigging up, and its No. 1 Whetstone, C Lot 4, Section 22-35-6w, spudded March 16.

R. C. Tarrant's No. 2 Britton, SW NW SE Section 14-34-6w, cemented the 5-inch on bottom at 2,902 feet.

The Texas Co.'s No. 1 Antrim, C Lot 4, Section 27-35-6w, is standing cemented at 402 feet, and its No. 1 fee, Lot 7, Section 15-35-6w, is drilling at 365 feet. Same company's No. 1 Long, W NW SW Section 23-35-6w, is building rig, and its No. 2 Purdy, C NE SW Section 35-35-6w, cemented the 10¾-inch at 350 feet with 100 sacks. The Texas Co.'s No. 2 Yunck, W SW SW Section 14-35-6w, is drilling at 200 feet.

Montana Power Co. is reported preparing to extend its power lines from Conrad to the Cut Bank Field, work to begin April 1.

Carbon County

Ohio Oil Co.'s No. 14 Maddox, C NW NW Section 10-7s-21, Dry Creek, is building derrick and then will wait for rotary from the Stanolind Oil & Gas Co.'s No. 21 Rosenberg, in the Frannie Field, on the Wyoming side.

Teton County

R. C. Tarrant's No. 1 Porter, SE cor. NE Section 35-27-5w, West Pondera, is drilling at 1,884 feet (cor.) at which depth it is through the Ellis. The 8¼-inch is at 1,840 feet.

UTAH

Ramsey Petroleum Co.'s No. 1 Weightman, SW NE SW Section 18-26-7e, Last Chance structure, Emery County, set the 12½-inch at 1,502 feet, and is drilling ahead at 1,635 feet. This operation resumed recently under an agreement with the American Oil Corp., of Los Angeles, of which J. W. Weightman is president.

Canadian Fields

(Continued from Page 144)

under arrangement with Stanley E. Davies, Clarence E. Snyder and T. G. Renner, holders of the acreage, who had charge of the drilling, cable tools being used. The oil is reported entirely free from sulphur.

Far South Operations

If production holds up in Highwood-Sarcee's No. 1, this far south extension of the field is likely to get a big play this spring and summer. Recently following the completion of Mar Jon-Freehold's No. 1 naphtha producer in Section 28, about a dozen tests have been started with the deep lime as an objective. Section 28 is traversed by the line where the Belly River formation outcrops above the Benton shale, though a few of the more southerly tests have been started in the former. Highwood-Sarcee's No. 1 is the first producer to start drilling in the Belly River, and on this account deeper drilling was looked for, especially after Hoffar-Lundy Syndicate's No. 1, to the south and east, discontinued work when faulted conditions were encountered.

So far, the most southerly test on the structure is Union Drilling Co.'s No. 1. This is in LSD 8, in the S half Section 21-18-2w5, about a mile south of Mar Jon-Freehold's No. 1 and a half mile south of the Highwood-Sarcee. Union's No. 1 has been shut down at 2,758 feet pending a change to rotary equipment. Following the strike, the Union well may continue with cable tools. It has logged very satisfactorily with the Highwood well, with no indications of faulting.

It is reported that other interests are planning to drill three tests still farther south, and it is now regarded as possible production may extend as far south as the Highwood River.

To Complete Hoffar-Lundy

Arrangements have been made whereby the unfinished Hoffar-Lundy Syndicate's No. 1, LSD 13, Section 22-18-2w5, will be taken over by Robert Wilkinson and associates of Calgary. This test quit drilling last December in a limestone below the cardium sand at 4,314 feet, it being then estimated that 5,600 feet of drilling would be required to reach the Blairmore formation. The location is just east of Highwood-Sarcee's No. 1 light crude producer. Since drilling was discontinued the log of North West Co.'s No. 1 C. & E. on the east side of the structure and the results just secured in the Highwood-Sarcee well, immediately west, have indicated that irregularities of formation in the upper horizons are not as significant as was at first thought, and the test will be carried to depth as an offset to the Highwood producer. The test was originally drilled by a syndicate composed of Henry S. Hoffar and Frank D. Lundy of Vancouver.

North West Co.'s No. 1 Calgary and Edmonton-Longview, LSD 5, Section 27-18-2w5, is drilling below 4,823 feet after cementing 8⅝-inch casing at 4,650 feet. This is the only test actively drilling on the extreme east side of the Turner Valley structure.

Mar Jon Section

In Section 28-18-2w5, Mar Jon Oil Co.'s No. 2 Kindersley, LSD 10, has encountered another porous horizon more than 930 feet in the lime at 5,870 feet and is bailing rotary fluid preparatory to testing. Some wet gas production was met in the upper lime and the gas flow has been gradually increasing.

In the same section, Pacalta Oils' No. 1, LSD 7, is making hole below 4,631 feet after plugging back and redrilling about 10 feet in the crooked hole sands. Director Royalties' No. 1, LSD 16, rotary test in charge of Boller, Sherman and Boller, is drilling below 1,660 feet and close to the cardium sands. Century Royalties' No. 1, LSD 14, Hilary Head, is making new hole below 2,300 feet. Richfield Royalties' No. 1, LSD 5, is drilling below 150 feet.

Publix Oil & Gas Co.'s No. 1, LSD 8, same section, which resumed recently is below 1,800 feet and making hole slowly in a very hard formation. British Dominion Oil & Development Corp.'s No. 4, LSD 6, half a mile east Mar Jon-Freehold's No. 1 producer, has spudded in. Spooner Oils' No. 5 Anaconda, LSD 1, same section, is making new hole below 4,300 feet. This is the nearest drilling to Highwood-Sarcee's No. 1 producer to the north.

Turner Valley Royalties' No. 1 Bell and Brown, LSD 13, Section 28-18-2w5, has secured drilling equipment and casing. New McDougall-Segur Oil Co. which recently disposed of its deep lime interests in Section 12-20-3w5 to Royalite Oil Co., has purchased for cash a 10 per cent interest in Turner Valley Royalties' No. 1. Test is expected to spud in next month.

Askalta Oils, Ltd. will drill in LSD 4, SW cor. Section 28-18-2w5, on acreage of Model Oils, Ltd. Askalta Oils holds LSDs 13 and 14, Section 24-17-2w5, on a potential southeast extension of the Turner Valley Field and this acreage may be tested later in the year. It is reported new drilling planned for the company's Red Coulee acreage this season will be deferred, pending the completion of its South Turner Valley test.

Arrangement for the Askalta test leaves open for testing in Section 28-18-2w5, only a small block of acreage along the southern line of section, held by Royalties Oil & Share Corp. of Calgary.

Mercury Tract

Farther north, in the Mercury tract, Associated Royalties' No. 1 Spray, LSD 9, Section 5-19-2w5, on the west side of the structure, is drilling below 3,805 feet and logging satisfactory.

Shareholders of East Crest Oil Co. at their annual meeting last week elected the following directors: James Perry, Dr. W. E. Spankie, A. M. Robertson, H. S. Price, H. H. Gilchrist, M. H. Staples, A. E. Shoebotham, all of Calgary; Thomas Lees, Oyen, Alberta; Newton Wilie, Toronto; Cupworth Anderson, Winnipeg, and Dr. W. K. Colbeck, Welland, Ontario.

Tests in the Foothills

In the Moose Mountain area west of Calgary, Elbow Oils' No. 1, LSD 11, Section 35-22-5w5, is drilling below 4,030 feet close to the Dalhousie sand.

On the Pekisko Hills structure south of Turner Valley, Pekisko Hills Co.'s No. 1, LSD 6, Section 6-17-2w5, is preparing to resume drilling.

Border Fields

In the Alberta border areas, Nordon-Roney's No. 2 Twin River, LSD 11, Section 2-2-20w4, is reported getting ready for acid treatment at 3,930 feet.

Saskatchewan Test

In western Saskatchewan, Twin Cities Oil Co.'s No. 1, in the Maple Creek area south of Cummings, will probably spud in this spring. C. Hatch is in charge of operations undertaken to secure gas production.

Ontario Drilling

In the Dover Field, Kent County, Ontario, Ajax Oil & Gas Co.'s No. 8 Antaya was drilled 92 feet into the Trenton and set 8-inch casing at 2,900 feet.

In Lambton County a Sarnia syndicate is preparing to drill a series of shallow tests on the Indian Reserve at Kettle Point, north of Forest. Arrangements are being made in Petrolia for drilling to start early in April.

In the Brooke shallow field, in Lambton County, a test drilled for Leo Wilson Syndicate west of the discovery well in Lot 23, Concession 13, is reported to have got a fair production. This well, unlike some of the earlier tests, shows a considerable oil sand. East of the discovery another new producer is reported to have been drilled in Concession 12.

Pelee Island Drilling

Drilling operations will be resumed on Pelee Island, in Essex County, Ontario, when navigation opens. The island, southernmost point in Canada is on Lake Erie opposite Kingsville and Leamington. It was prospected for oil more than 30 years ago, when a number of shallow tests gave a fair production from the corniferous limestone. The Great Lakes Oil & Gas Co., Ltd. has recently been incorporated and will take over the interests of the Pelee Island Oil & Gas Co.

CONTINENTAL DIVIDEND

NEW YORK, Mar. 26. — Continental Oil Co. of Delaware has declared a dividend of 25 cents a share. The last payment was $1 on March 31, 1927, by the predecessor company, Marland Oil Co.

The Continental company also called for retirement on May 1 of $1,500,000 of 5¼ per cent debentures of Continental Oil Co. of Maine at 101.

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TECHNICAL QUESTIONS ANSWERED

By Charles K. Francis, Ph. D., Technical Editor

This department of The Oil and Gas Journal is devoted to the manufacturing branches of the oil industry.

Those connected with the refining of crude petroleum, the manufacture of natural gasoline and closely allied industries are invited to submit their problems to Dr. C. K. Francis, technical editor. The department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in the various phases of plant operation; also those connected with marketing and utilization of petroleum products.

Questions should be submitted in as much detail as possible.

Inquiries must be signed but only the given initials will be printed. The source of the question is considered to be confidential

Questions requiring a discussion of patents, the use of intricate formulas, extended computations, or cost estimates cannot be considered.

When the matter is of general interest the reply will be published within a reasonable time.

Source, Manufacture and Use of Menhaden Oil

Will you kindly tell me how Menhaden oil is obtained and what use is made of it? What are its properties?—F. H. A.

Menhaden oil (French, Huile d' Alose) is obtained from the fish, alosa menhaden, which gets its name from the Narragansett Indian word meaning fertilizer, because they used the fish as a ferilizer in the growing of corn. It is a fish related to the shad and herring which is caught in large numbers off the Atlantic Coast of the United States during the summer season.

The chief value of the fish is as a source of nitrogenous fertilizer, the oil being a by-product. The oil is extracted by cooking the fish in live steam, the fish being placed on conveyors which pass through the cookers. The process is continuous, each fish being cooked about 20 minutes. The cooked fish is delivered to settling tanks, the oil rising to the top and the residue, scraps, settling to the bottom. The scrap is pressed for additional oil and the pressed cake dried to be sold for fertilizer.

The best grade of menhaden oil is light in color, composed almost entirely of glycerides, with but a small quantity of unsaponifiable matter.

Distinguishing properties are:

Specific gravity	0.9311
Melting point	24° F.
Saponification value (mgm. KOH)	192
Iodine value	170

It is extensively used for making soaps used in greases, in compounding oils, and in the manufacture of linoleum.

Determining Loss or Outages of Petroleum Shipments

Do you have any information which would give the correct procedure to be followed in gauging cars of fuel oil on arrival in order to determine the correct gallonage? —W. C. O.

The capacity of the tank cars used for the transportation of petroleum and petroleum products is stenciled on each car to comply with the regulations of the Interstate Commerce Commission, the American Railway Association, and the Bureau of Explosives. The details relating to all cars may be obtained direct from the owner or from these agencies. See also, E. R. Boyd's Tank Car Circular for a list of tank cars, with information about capacities and methods for measuring contents of these cars. This publication may be purchased from the Western Trunk Line Freight Bureau, 516 West Jackson Boulevard, Chicago, Ill.

All tank cars are listed by number and usually grouped as to size and service showing the capacity of the shell or tank and in addition the gallons per inch in the dome. The standard temperature for the measurement of petroleum liquids being 60° F., all temperatures should be reduced to this before making any volume calculations. When weights are obtainable it is not necessary to consider temperature. Each car is carefully measured and the holding volume tabulated, usually from the bottom to the top, in feet and inches with the equivalent gallonage, in what is known as a calibration table.

The regulations of the Interstate Commerce Commission and the Bureau of Explosives stipulate that:

"Packages containing inflammable liquids must not be entirely filled. Sufficient interior space must be left vacant to prevent leakage or distortion of containers due to the expansion of the contents from increase of temperature during transit.

"The proper vacant space or outage in a tank car or other shipping container depends on the coefficient of expansion of the liquid and the maximum increase of temperature to which it will be subjected in transit. Outage must be calculated to the total capacity of the container.

"In tank cars outage must be calculated to percentage of the total capacity of the tank, i.e., shell and dome capacity combined. If the dome of the tank car does not provide sufficient outage, then vacant space must be left in the shell to make up the required outage."

True classification and correct weight, or volume, of all articles transported are required by law; any false statement when known to be false, is considered a fraud declared to be a misdemeanor punishable by fine and imprisonment.

Yield of Petroleum Products by Russian Refineries

Can you tell me what yields of the different petroleum products are being obtained by the Russian refineries, or the total output of basic products?—N. R.

Statistics concerning the condition of the petroleum industry in the U.S.S.R. have been reported by the Russian Oil Products, London. According to this report the production of gasoline during the month of December, 1933, was 172,650 tons and 2,654,450 tons for the year 1933. A metric ton is equivalent to 2,204.6 pounds. Oil of 36 A.P.I. gravity weighs 295.596 pounds per barrel, or about 7.5 bbls. to the ton. For estimating purposes it is the practice to use one ton as the equivalent of 7 bbls.

The reports state that the gain in gasoline was 5.3 per cent, lubricating oil increased 15.6 per cent, and the fuel oil production declined 15.7 per cent.

Domestic oil consumption of all products in Soviet Russia declined by 229,100 tons in December compared with the same month in 1932, and by 1,100,500 tons, or 7.7 per cent, less in the year than in 1932. This large drop is more than accounted for by the fact that the country used 1,470,700 tons, or 15.7 per cent, less fuel oil in the year, for the consumption of most other refined products showed rises, viz., gasoline, 19 per cent; kerosene, 5.3 per cent, and lubricating oil 15.6 per cent, the details as to domestic consumption being (in tons):

	Dec., 1933	1933	1932
Gasoline	56,500	1,064,900	894,900
Kerosene	142,100	3,189,600	3,027,700
Lub. oil	45,800	874,500	756,300
Fuel oil	569,200	7,885,600	9,356,300
Other prod.	19,700	245,200	325,100
Total	833,300	13,259,800	14,360,300

The reason for the decline in fuel oil consumption is given as being due to its successful replacement by coal in certain industries.

Reference Books Related to the Refining of Petroleum

It is my desire to build up a library on the general subject of the oil and gas industry and wish to enlist your aid in procuring a list of desirable titles. Books of a technical nature including chemistry, physics, and gas measurement are preferred. Any books that you believe would be of value I should like to be included. —R. O.

The following are considered to be very serviceable books for reference purposes by executives, chemists, engineers and everyone interested in the technical matters of the refining of petroleum:

"Petroleum Technology," Gurwitsch-Moore, $9.

"Petroleum and Its Products," Gruse, $4.50.

"Chemical Annual," seventh edition, Olsen, $6.

"Industrial Chemistry," Read, $5.

"Chemistry and Technology of Cracking," Sachanen and Tilicheyev, $8.

"Recovery of Gasoline from Natural Gas," Burrell, $7.50.

"Handbook of the Petroleum Industry" (2 vols.), Day, $15.

"Chemical Refining of Petroleum," Kalichevsky-Stagner, $7.

"Lubricating Greases," Klemgard, $5.50.

"Elements of Chemical Engineering," Badger and McCabe, $5.

"Natural Gas Handbook," Diehl, $5.

"Oil Economics," Osborn, $4.

"Business of Oil Production," Johnson-Huntley-Somers, $3.50.

"Fractional Distillation," Robinson, $3.

There are numerous publications of the U. S. Bureau of Mines, aso the Bureau of Standards, which are a source of technical information about the petroleum industry. These are obtainable through the Superintendent of Documents, Washington, D. C., at low cost.

The books mentioned in the list may be obtained through the Book Department of The Oil and Gas Journal.

The book by Diehl, "Natural Gas Handbook," will give the essential principles of gas measurement.

Chemicals for Refining Petroleum Products—Sodium Hydroxide

This is a part of a series of brief descriptions of chemicals used in petroleum refining, the first being given in answer to O. B. B. in the issue of March 15, 1934.—Editor.

Sodium hydroxide, caustic soda or caustic, is consumed in very large quantities for the purification of petroleum distillates, especially gasoline and kerosene. The refineries of the United States require each year something over 1,000,000 tons of sodium hydroxide, being the largest quantity used by a single industry; 134,000,000 tons were used in 1929.

It is used as a neutralizing wash after acid treatment, for the removal of hydrogen sulphide, and for making the sodium plumbite solution which is extensively applied in the sweetening or doctor operation.

The wash and neutralizing solutions are commonly made with water to a strength represented by 1° to 2° Be. The doctor solution, sodium plumbite, is a saturated solution of litharge in a water solution of the sodium hydroxide. The strength of this solution may range from 10° to 20° Be.

Sodium hydroxide is an important reagent for the removal of color forming bodies, reduction of sulphur, elimination of objectionable odors, and the lowering of the distillation endpoint when applied after the acid treatment because of the action on the sulphuric esters that are frequently present in the acid treated distillates. Some caustic is used for treating hot vapors, it being used for this purpose either as a wash in the towers, or sometimes filtering earth, stone or porous material is saturated with it and the hot vapors directed through the mass.

The two processes now in use for the manufacture of caustic soda are not complicated. The electrolytic method makes hydrogen, chlorine and sodium hydroxide by the decomposition of sodium chloride brine; the process being considered primarily for the preparation of chlorine and hydrogen, with the sodium hydroxide a by-product. The liquid from the electrolysis passes to evaporators and settling tanks to be concentrated and reduced to the solid form. The other method, called the causticization process, makes use of the fact that if a solution of sodium carbonate is heated and then treated with calcium hydroxide, there will be formed a precipitate of calcium carbonate and the liquid will be essentially sodium hydroxide. This solution is settled and concentrated as in the electrolytic method.

The solid caustic soda is marketed in three grades containing 74, 76 and 78 per cent sodium oxide, which corresponds to 94.4, 96.9 and 98.7 per cent pure sodium hydroxide. The normal impurities consist of sodium chloride, sodium sulphate, sodium carbonate and moisture.

Properties: Formula NaOH, molecular weight, 40.01; specific gravity, 2.13; melting point, 604° F.; soluble in water, alcohol, ether, and glycerin.

Price: The normal selling price of the 76 grade, at point of origin, is approximately $40 per ton.

NATURAL GAS DEVELOPMENTS

Governor Orders Survey of Michigan Gas Reserves

MUSKEGON, Mich., Mar. 26.—Governor William A. Comstock has ordered an investigation of the natural gas resources of Michigan to determine whether applications pending before the State Public Utilities Commission to lay lines to larger cities should be granted.

Manfred K. Toeppen of Detroit has been engaged to co-operate with the utilities commission, the geological survey division of the conservation department and the Bureau of Mines in making the new survey.

Governor Comstock's expressed aim in the survey is to determine if it will be possible to increase the utilization of Michigan's natural gas resources with the resulting effect of lowering gas rates throughout the State, both natural and artificial.

Recent estimates of the State Conservation Department place state gas reserves at 35,000,000,000 feet while A. Thomas Sarkisson, head of the Industrial Natural Gas Pipe Line Co., which has applied for a permit to lay a $4,500,000 line to Detroit, Flint and Pontiac, claims to have "engineers' estimates." There is at least 150,000,000,000 feet proved in addition to "enormous untapped reserves." Sarkisson's company proposes to lay a 240-mile pipe line.

The application is considered particularly significant in view of the recent report of William S. Sayres, master in chancery for the Federal court, who upheld the right of the city of Detroit to oust the Detroit City Gas Co. unless it pays $1,500,000 rentals for lines under the city streets.

It is estimated nearly 20,000,000 feet of gas daily is being lost in the air from producing oil wells in the various Michigan fields. The Industrial Gas Pipe Line Co. estimates it would require 75,000,000 feet a day to serve Detroit, Flint and Pontiac.

It is proposed to operate the line at 400 pounds pressure and erect storage plants in Detroit with a capacity of 25,000,000 feet.

A rental of $125,000 was first proposed by Councilman and former Mayor John W. Smith in 1932, after a long dispute with the Detroit City Gas Co. over rates. Mayor Frank Murphy accepted a voluntary reduction of $850,000 a year in rates which Smith claimed was not enough. Company officials say rates would have to be increased 8 cents per 1,000 feet to meet the proposed rentals but could not be increased this much under present conditions.

HOUSTON NATURAL GAS CORP.

BALTIMORE, Md., Mar. 26.—Report of Houston Natural Gas Corp. and subsidiaries for year ended December 31, 1933, shows net profit of $123,107 after interest, depreciation, amortization, Federal taxes, etc., equivalent after dividend requirements on 7 per cent preferred stock, to 58 cents a share on 150,461 combined shares of no-par Class A and common stocks. This compares with $168,984, or 89 cents a share on combined Class A and common stocks in 1932.

TO U. S. SUPREME COURT

WASHINGTON, D. C., Mar. 26.—Validity of an order of the Oklahoma Corporation Commission fixing the rate at which the Oklahoma Natural Gas Corp. is required to furnish gas to Wilson & Co.'s packing plant in Oklahoma City, Okla., will be decided by the U. S. Supreme Court.

Program for Gas Measurement Course at Norman, Okla., April 24-26

D. C. Williams, of Ponca City, Okla., chairman of the program committee for the Southwestern Gas Measurement Short Course, to be held at the University of Oklahoma, Norman, April 24, 25 and 26, has released the program in final form as follows:

Tuesday April 24

8 to 9:30 a.m.

Registration: Hall of the Engineering Building.

9:30 to 11:30 a.m.

General Assembly: Auditorium, third floor.

Presiding: W. R. McLaughlin, Arkansas Natural Gas Corp., chairman of Meter School Committee.

Introduction of Doctor Bizzell: E. F. McKay, manager of Oklahoma Utilities Association.

Address of Welcome: Dr. William Bennett Bizzell, president, University of Oklahoma.

Introduction of the Meter School Committee: W. R. McLaughlin, Arkansas Natural Gas Corp.

The Natural Gasoline Association and American Gas Association: Natural Gasoline Association of America, and the Meter School, by Ray E. Miller, secretary; Natural Gas Department of A.G.A. and the Meter School, by A. E. Higgins, secretary.

Address: W. P. Z. German, general attorney, Skelly Oil Co.

Announcement of Committee for Study of Practical Methods: Gilbert Estill, chairman.

Tuesday Afternoon

Period 1—1 to 2 pm.

(a) Domestic Meters, Metric Metal Works of American Meter Co.

(b) Large Capacity Positive Meters, Pittsburgh Equitable Meter Co., A. D. MacLean.

(c) Chaplin-Fulton High Pressure Regulators, Thomas H. Thorn.

(d) Westcott Orifice Meters.

(e) Determination of Line Losses: (1) High Pressure Lines, Earl Kightlinger, Arkansas-Louisiana Pipe Line Co.; (2) Low Pressure Lines, R. W. Parker, Oklahoma Natural Gas Corp.

(f) Functions of Field Meter Men, E. E. Stovall, Lone Star Gas Co.

(g) Problems of Elementary Gas Laws, E. F. Dawson, University faculty.

Period 2—2 to 3 p.m.

(a) Orifice Meters, Pittsburgh Equitable Meter Co., J. H. Baker.

(b) Large Capacity Positive Meters. Metric Metal Works.

(c) Low Pressure Regulators, Pittsburgh Equitable Meter Co., S. J. McArt.

(d) Calculation of Orifice and Positive Meter Charts, R. O. Cox, Lone Star Gas Co.

(e) Field Testing of Large Capacity Positive Meters, B. Porter, United Gas Co.

(f) Well Capacities, E. C. McAninch, Oklahoma Natural Gas Corp.

Period 3—3 to 4 p.m.

(a) Domestic Meters, Sprague Meter Co., H. A. Kahler.

(b) Foxboro Orifice Meters, J. B. McMahon.

(c) Practical Meter and Regulator Stations, R. M. Scofield, Lone Star Gas Co.

(d) Operation of Calorimeter, S. H. Cromer, University faculty, assisted by B. F. Worley, United Gas Co.

(e) Emco-McGaughy Integrator, J. L. Cottrell, Pittsburgh Equitable Meter Co.

(f) Problems in Elementary Gas Laws, E. F. Dawson, University faculty.

Wednesday Morning, April 25

8 to 8:45

General Assembly: Auditorium, third floor, W. R. McLaughlin, presiding.

Fundamental Gas Laws, E. F. Dawson, University faculty.

9 to 9:45

Fundamental Principles of Regulators, J. C. Diehl, Metric Metal Works.

10 to 10:45

Fundamental Principles of Orifice Meters, W. W. Frymoyer, Foxboro Co.

Fundamental Principles of Positive Meters, A. D. MacLean, Pittsburgh, Equitable Meter Co.

Wednesday Afternoon, April 25

Period 4—1 to 2 p.m.

(a) Domestic Meters (Emco), Pittsburgh Equitable Meter Co., J. H. Baker.

(b) Westcott Orifice Meters and Rate and Volume Control.

(c) Chaplin-Fulton Low Pressure Regulators, Thomas S. Thorn.

(d) Specific Gravity Balance, Refinery Supply Co., C. R. Duffy.

(e) Problems of Wet Gas Measurement, round table discussion, George P. Bunn, assisted by G. W. McCallough, Phillips Petroleum Co.

(f) Casinghead and Residue Pressure Regulation, Norris Plank, Shell Petroleum Corp.

(g) Foxboro Orifice Meters, J. B. McMahon.

Period 5—2 to 3 p.m.

(a) Domestic Meters, Metric Metal Works of American Meter Co.

(b) Care and Operation of Orifice Meters, L. G. Rheinberger, Sinclair Prairie Oil Co.

(c) Bell Prover Operation, Pittsburgh Equitable Meter Co., A. D. MacLean.

(d) Practical Operation and Installation of Recording Temperature Gauges, R. L. Roundtree, United Gas Co.

(e) Foxboro Pressure Control, G. B. Lane.

(f) Operation of Slide Rule and Gas Rule, H. V. Beck, University faculty.

(g) Field Testing of Large Capacity Positive Meters, B. Porter, United Gas Co.

Period 6—3 to 4 p.m.

(a) Domestic Meters, Sprague Meter Co., H. R. Pierce.

(b) Large Capacity Positive Meters, Pittsburgh Equitable Meter Co., A. D. MacLean.

(c) Bell Prover Operations, American Meter Co., J. C. Diehl.

(d) Well Capacities, E. C. McAninch, Oklahoma Natural Gas Corp.

(e) Calculation of Orifice Coefficients, Max Watson, Canadian River Gas Co.

(f) Calculation of Orifice and Positive Meter Charts, R. O. Cox, Lone Star Gas Co.

(g) Reconditioning of Mercury, Refinery Supply Co., H. F. Goodenough.

(Continued on Page 152)

City Can Tax Competitor Of Its Municipal Plant

WASHINGTON, D. C., Mar. 26.—Although it is the operator of a municipally owned electric light and power plant, the city of Seattle, Wash., according to a U. S. Supreme Court opinion, is within its constitutional rights in taxing the gross income of a private corporation competing with the municipal enterprise.

Justice Stone wrote the opinion which permitted imposition of a 3 per cent tax, even though the private plant, the Puget Sound Power & Light Co., contended this contravened the Fourteenth Amendment and contract clause of the Constitution.

Justice Van Deventer wrote a concurring opinion in which Justices McReynolds, Sutherland and Butler joined. This opinion agreed that the Seattle ordinance imposing the tax did not violate the due process of the contract clause of the Constitution, but was on different grounds from those stated by Justice Stone.

The court made a similar ruling in the case of the Seattle Gas Co., which claimed it, too, was at a disadvantage because the tax free municipal light plant would try to switch gas consumers to the use of electricity.

Gas Referee Sustained by Minister of Mines

TORONTO, Ontario, Mar. 24.—In the Ontario legislature, Charles McCrea, minister of mines, speaking with reference to the administration of the natural gas industry in Ontario, stated the present setup with relation to rate fixing and control, with a natural gas referee to fix rates and an appeal from his rulings to the Supreme Court of Ontario can scarcely be improved upon. Representations had been made to him earlier in the year from western Ontario with a view to transferring appeals from the Supreme Court to the Ontario Municipal Board. Originally the municipal board had jurisdiction and as a result of dissatisfaction of the municipalities themselves the change was made to a gas referee and later the appeal to the Supreme Court was granted.

It was difficult, he said, to satisfy everybody. Representations had been made that when prices of other commodities were scaled down 50 per cent natural gas rates should be correspondingly reduced. On the other hand the gas companies were unable to pay dividends and their revenues were declining. The present system, with the referee fixing rates and an appeal from his decisions, seemed the fairest possible. Where representations were made the government had tried to assist the municipalities, but the minister of mines had no power to intervene in the matter of rates.

NEW OTTAWA GAS SUPPLY

OTTAWA, Kans., Mar. 26.—A new gas field north of Ottawa, developed by the Franklin County Gas Co., is being connected with the Ottawa municipal water and light plant, supplementing the supply of gas from a field west of the city. The new pipe line is about 3 miles in length and will tap 10 commercial producing wells.

AUGUSTA SEEKS SUPPLY

AUGUSTA, Kans., Mar. 26.—The city council has passed a resolution favoring a permanent gas supply for the city to be delivered at the city gates at a reasonable rate. The city would have to put in its own distributing system.

FIELD PROBLEMS FROM READERS

Edited by Thomas F. Smiley

This department is conducted in order that men connected with the drilling, producing and transporting branches of the petroleum industry may obtain aid in solving problems that confront them in their work. Readers are invited to send questions freely. These questions will be placed in the hands of persons capable of answering them authoritatively, and the answers, based on the best available information, will be published.

Each question should give as much detail as possible, especially if it involves depth of sands, types of sands and operations on adjoining or nearby properties. The source of questions will be considered confidential, and only the initials of the sender will be published. Questions involving patented processes, intricate formulas or estimates of cost cannot be answered. If an immediate answer is important, one will be given by mail when the writer requests it.

In this connection, The Oil and Gas Journal will be glad to publish articles from field men who have devised new methods or improved old ones.

Improbable Anything Introduced Into Line Will Seal Holes

We have two 10-inch natural gas lines crossing a river, each approximately 1,000 feet long. The operating pressure is 75 pounds. These lines do not leak at 40 pounds pressure, but show leakage at 45 pounds and above. Small bubbles come to the surface of the water and because of river regulations it is necessary that we stop this leakage. We do not want to take the line up at this time, and we are inquiring if there is some chemical solution that might be introduced into the line to seal what we believe are pin holes. At the present time we are experimenting with a mixture of tar and naphthalene, heating this mixture in a two-inch line and letting it follow the flow of gas to the leaks. We have thought of using soap. We realize it will be only a temporary job, but if it will stop the leaks until spring, that will do.—F. W. F.

This department has failed to learn of any material that can be introduced into the pipe line and, traveling with the gas stream, tend to seal small holes in the pipe. Old natural gas men say they have heard of experiments made with various kinds of material to gain these results but have never learned of any that were successful.

Foreign material that might be introduced into the gas pipe line would travel into distributing lines and when it reached the point of consumption it is probable that it would plug up apparatus in which the gas was consumed.

If the gas is scrubbed to eliminate foreign material it is probable that an element suitable for plugging small leaks introduced into the gas stream would have to be in such quantity that it would quickly clog the scrubbers.

The assumption that the line leaks only when the pressure is about 45 pounds does not seem to check with facts known about other lines. It has been found that gas will leak from a line at low pressure but not in sufficient quantity to travel direct to the surface in the form of gas bubbles. So it is quite probable that your line is leaking all the time and a check of input and delivery would indicate the quantity of gas lost.

Utilizing the Gas-Engine Exhaust for Heat to Warm Crude Oil

I wonder if there is not some fairly simple way of utilizing the exhaust from gas engines to provide heat for warming crude oil. Can you tell me whether such a device is in use and what it consists of?—T. S. E.

Many operators have made use of the heat in the exhaust gases from their engines by diverting the exhaust into heat exchangers. There are home-made devices consisting of large diameter pipes welded over smaller diameter pipe. The annular space between the inside of the large pipe and the outside of the small pipe serves as a means for conducting the exhaust gas from engine to atmosphere.

As this hot gas travels toward the atmosphere-exhaust end of the exchanger the heat contained in it is transferred, at least in part, to the fluid or gas in the small pipe. The problem of heat transfer is one for experienced engineers and designers to solve if best results are to be gained. However, home-made devices are better than exhausting the engine gases direct to the atmosphere if there is any use to be made of the heat remaining in such exhaust gas.

In Kent's Engineering Handbook, page 1249, under "Gas Engines" it is stated: "The amount of heat lost in the exhaust gases and cooling water is from 65 to 70 per cent of the total heat supplied to the engine in the gaseous fuel." It is suggested that this heat be utilized for heating water in a boiler and the book gives specifications for a boiler suitable for this purpose. The temperature of the gas entering the boiler is said to be about 842° F. and the temperature of the gas leaving it about 518° F.

The size of the engine, its speed, the kind of fuel used and a number of other factors should be considered in designing heat exchangers and it is really a problem for manufacturers of this kind of apparatus and it is suggested that you turn it over to them.

Crude Production Per Acre From Sands of Varying Thickness

Is there any method which can be called fairly accurate of ascertaining the production of oil that may be recovered per acre from sands of different thickness? I have seen a statement that the average production per acre is about 10,000 bbls., but this is supposed to include sands of all thicknesses. It seems to me it should be possible to estimate the production of a pool with some degree of accuracy where you know the thickness of the producing sand.—N. H. D.

Many statements have been made about average recovery and average saturation of formations containing oil that have been based upon many assumed conditions later proven to be wrong.

In the past there was little occasion for coring formations as the wells were completed, and the operators' first concern was to finish the well in the best possible mechanical condition and get as much oil as possible regardless of the character of the formation from which it was produced.

In more recent years when it has been necessary to make detailed studies of formations to determine physical conditions upon which data it was possible to formulate future production methods it has been found that many of the guesses were far from the facts.

The statement that the average production per acre is about 10,000 bbls. may be fairly accurate if the total amount of oil produced is divided by the total number of productive acres. But that sort of statement does not mean very much because it avails a producer little to be told that the average production is 10,000 bbls. per acre when he already has recovered perhaps 10 times that amount from his property or when he has recovered only one-tenth of this quantity. And both quantities have been produced from similar formations.

Coring devices that can get good cores in either cable tool, rotary or cored holes, are now available to the industry. There is no excuse for finishing a well blind. The cores can be taken to laboratories where definite data can be obtained regarding them and close estimates of their original content and the probable recovery can be ascertained. This costs money, of course, and many operators go on the theory that they are lucky and will get their share of the oil anyway but the more modern operator is not satisfied with such assumptions and is having his formations cored and analyzed.

Thinks Signs Point to Presence of Oil in Western Kentucky

I do not know much about geology, but I have had some experience in the Pennsylvania oil fields and I have some notion of the kind of surface characteristics that are likely to indicate the presence of oil. Recently I passed several days in Muhlenberg County, in the western part of Kentucky, and I noted some peculiarities that looked to me like signs of oil there and in the district just west of that county. Can you tell me whether geologists ever have made a study of that area and what their opinions were?—T. H. W.

There is good geological support for your belief that indications point to oil in the western Kentucky area. Surveys made by the State and by the U. S. Geological Survey were designed chiefly to define coal areas and little thought was given at the time to oil or natural gas. Dorsey Hager, widely known petroleum geologist, made a study of counties in southwestern Kentucky and in his report he said:

"After my study of southwestern Kentucky, and by that I define the area specifically as comprising parts of Webster, Caldwell, Christian, Hopkins and Muhlenberg Counties, I have reached the following conclusion, namely:

"No sound or valid reasons theoretically nor practically exist why that area should not prove as productive of petroleum and natural gas as other western Kentucky counties, such as Ohio, Daviess and Hancock Counties, for the following reasons:

"1. There are already three commercial natural gas pools in the area, and three small oil pools showing that oil and natural gas do occur in the area.

"2. The faults on analysis provide favorable traps for commercial oil and gas pools, as five of the six gas and oil fields are along faults or related to them.

"3. Anticlines and domes in number do occur there besides the faults mentioned in (2).

"4. Sand conditions appear as favorable as in other producing areas of western Kentucky.

"5. I have found but one dike in this area and that outside favorable limits, and no important metamorphic action in the area I have studied.

"6. An analysis of the test hole data shows that oil and gas could hardly have been anticipated where most of the tests were situated.

"Whether or not the area will prove as commercially profitable as other western Kentucky areas remains to be proved, but I anticipate it will prove fully as important, if not more so, for oil and for natural gas. Certainly geological conditions here warrant testing on favorable structural conditions instead of the sporadic hit and miss testing methods used to date.

"There is, as I see it, no chance there to open any very large oil fields, nor immense gas fields, that will menace the oil or gas industries. There is, however, a chance to open 25 or 30 new oil and gas pools. The attractions of that area are the low costs of testing and of operating so that even small producing oil wells will prove profitable. There is also a good market for natural gas if it can be developed in volume.

"The area has been passed by, due to lack of intelligent studies by the oil and gas men and too by the fact that testing there largely took place when the oil industry was on the down grade."

Why Was It Called That?

JEW'S PITCH

"Jew's pitch" is one of several names given to the bitumen or asphalt (residue from evaporated petroleum) of ancient Judea. "Slime" and "pitch" are familiar biblical designations of the same substance, and their use in that sense is self-explanatory. An interesting story is to the effect that a director of the Standard Oil Co. pondered over the second chapter of Exodus, which tells how the mother of Moses "took for him an ark of bulrushes and daubed it with slime and with pitch." Where there is pitch there must be petroleum, the oil man figured. So exploratory work was begun and today there are oil wells near where the Old Testament lawmaker was born.

PERSONAL PARAGRAPHS

RUSSELL MOORE has taken a position with the Mid-Continent Supply Company in Longview, Tex.

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D. A. LITTLE, president of the Magnolia Petroleum Company, Dallas, Tex., has just returned from a business trip to New York.

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E. C. GORDON ENGLAND, director of the Vacuum Oil Company, has returned to London, England, from a visit to the United States.

• • •

B. C. VERNON, formerly scouting in East Texas, has been assigned to the scouting department of the Magnolia Petroleum Company at Houston, Tex

• • •

C. S. SANDERS, assistant superintendent of production for the Stanolind Oil & Gas Company, has returned to his office in Tulsa from a trip to the company's properties in Salt Creek, Wyo., and Iles Dome, in Colorado.

• • •

C. OSICEANU, general manager of the Steaua Romana S.A., and president of the Rumanian Association of Petroleum Industrialists, has been decorated by the King of the Belgians with the honor of Grand Officer of the Order of Leopold I.

• • •

M. E. ROLLINS has been elected a director of the Pacific Western Oil Company as a representative of the Getty interests of Los Angeles.

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H. R. MILNER, president, and E. W. BOWNESS, vice president, of the Canadian Western Natural Gas, Light, Heat & Power Company, of Calgary, Alberta, recently visited New York in connection with company business.

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J. W. MALSEED, marine terminal superintendent of the Shell Oil Company at Los Angeles Harbor, has been appointed chairman of the attendance committee of the Bilge Club, an organization of national importance among shipping men.

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T. O. GRISELL and SAMUEL A. HARTWELL, JR., of the Pennsylvania Grade Crude Oil Association, held a meeting of member marketers at the Hotel Queens in Montreal this week. Meetings also are being held at Buffalo and Pittsburgh.

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LEE HAGER, independent oil man, Houston, Tex., has been appointed chairman of the Harris County Board of Welfare and Employment, a position to which is attached considerable responsibility in the direction of relief work of the county, of which Houston is the county seat.

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HUGH A. MATIER, of the Union Oil Company, for several years representative of the company in the Santa Maria, Calif., district and subsequently employed at the headquarters of the company at Los Angeles, has been temporarily transferred for special duty in the Seattle, Wash., district.

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JOSEPH McGRATH, DAVID FARRISS, ROY FERGUSON, NORMAN CHANDLER, FREDERICK D. ANDERSON and R. E. HAVENSTRITE have been elected to the board of directors of the Republic Petroleum Company of California, the by-laws having been changed in order that the company might have the benefit of their experience in the production of oil and gas in both California and Texas.

H. S. PAHREN, Tulsa representative of the Elliott Company, Jeannette, Pa., is rejoicing over the birth of a son, Wednesday last.

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W. J. LOFTIS, formerly with the Prairie Oil & Gas Company in Amarillo, Tex., has taken a position on the legal staff of the Phillips Petroleum Company in that city.

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A. F. (HAPPY) NIXON, vice president of the Happy Belting Company, Fort Worth, Tex., who was operated on for appendicitis on March 13, has been removed to his home and is improving as rapidly as possible.

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C. P. PARSONS, chief field engineer for the Halliburton Oil Well Cementing Company, will give a talk at the meeting of the Texas Panhandle chapter of the American Petroleum Institute at Pampa, Tex., on the evening of March 30.

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R. S. LEE, formerly pilot for JOHN MABEE, drilling contractor, is making a 9,000-mile airplane trip with DAVID PINCUS, of New York City, director of production, to make an air movie to feature the facilities of the Gulf Refining Company.

C. F. O'BRIEN, president of the O'Brien Steel Construction Company, of Washington, Pa., was a Mount Pleasant, Mich., visitor last week.

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FRED H. BARNEY, representative of American Manufacturing Company, Fort Worth, Tex., has just completed a trip through West Texas.

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H. G. LEA, of Houston, Tex., has been elected a director of the Standard Oil Company of Kansas to succeed C. J. WRIGHTSMAN, who resigned last summer.

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ROBERT HEAL, of Moore Township, Ontario, who returned from the Borneo oil fields about two years ago, has taken a contract to drill for oil in Persia and will sail about March 23. He will drill for the Shell Oil Company.

• • •

MAJ. T. J. STRICKLER, vice president and general manager of the Kansas City Gas Company, has been endorsed by the American Gas Association and the Pacific Coast Gas Association for nomination as a director of the Chamber of Commerce of the United States to represent the Seventh Election District.

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W. E. FLINT, of Artesia, N. Mex., has been made sales manager for the State Oil Service Company.

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JOHN P. FLYNN, of the Reno Oil Company, Sistersville, W. Va., attended a meeting of the board of directors of the Pennsylvania Grade Crude Oil Association in Oil City last Friday.

• • •

CAD A. RONEY, of Los Angeles, Calif., who has been in Lethbridge, Alberta, for some time in connection with the Nordon-Roney test on the Twin River structure, has left for a trip to the Wyoming oil fields.

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P. D. MELLON, chief engineer, and H. E. TIMMINS, accountant, of the Canadian Western Natural Gas, Light, Heat & Power Company, of Calgary, Alberta, recently visited the Lethbridge branch of the company's distributing system.

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JAMES M. SNOWDEN and GEORGE SNOWDEN, of New York City, officers of Snowden & McSweeney, and of the United States Potash Company, were inspecting the properties of those companies in southeastern New Mexico the past week.

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T. K. MIAL, vice president and general manager, Johns Manville Company, New York; T. C. GREENWOOD, district manager, St. Louis, Mo., and J. M. TAYLOR, vice president, New Orleans, La., are due in Houston, Tex., on a business tour pertaining to the oil business.

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EUGENE COSTE, of Toronto, has been appointed to the directorate of Morning Star (Fairview) Gold Mines, Ltd., operating in British Columbia. Mr. Coste was the first mining engineer of the Geological Survey of Canada and is a former president of the Canadian Mining Institute. He was the founder and first president of the Canadian Western Natural Gas, Light, Heat & Power Company of Calgary, Alberta, and actively associated with the Volcanic Oil & Gas Company, later merged in the Union Gas Company of Canada, Ltd.

DO YOU REMEMBER?

From The Oil and Gas Journal Files

25 Years Ago

March 29, 1909

Chief Engineer Daniel W. Patton, of the Sapulpa & Interurban Railroad, writes that a line will be constructed from Sapulpa to Glenpool, Okla., to connect with the Midland Valley Railroad.

Capt. Thomas Alexander Spencer, of the Producers Oil Co., will be married to Miss Louise Chestnutt, in Montgomery, Ala., on April 7. They will reside in Houston, Tex.

Burt Gooderham, of the Sun Co. at Beaumont, Tex., will be married to Miss Leone Hoopes of Beaumont, on April 7.

20 Years Ago

April 2, 1914

A partial shutdown of drilling operations and a curtailment of deep sand production in the Cushing Pool in Oklahoma is expected to relieve the overproduction situation and perhaps save the crude oil market.

Capt. Peter Grace, one of the big figures in the early history of oil production, dies in Robinson, Ill., and was buried in Arlington Cemetery in Washington, D. C. One of his exploits, in partnership with George Dimmick, was the opening of the Cherry Grove Field in Pennsylvania, with the historic "646" well.

F. E. Shriver writes from Yenangyaung, Burmah, that over 100 American drillers are working in that field. Incidentally he pays for The Oil and Gas Journal for two years in advance, saying he can't get along without it.

Sam Travis, of the Oklahoma Petroleum & Gasoline Co., Tulsa, and Mrs. Travis, are enjoying a delayed honeymoon in Paris, France, which is Mrs. Travis' native city.

Benjamin F. Brundred, of the Eclipse Oil Co. and other interests, dies in Oil City, Pa.

The "deep well" in Bradford, Pa., field, has been abandoned in a very hard limestone formation at 5,830 feet. It cost nearly $20,000, which was raised by subscription. The drillers were V. P. Kipgen and F. C. Wheeler.

10 Years Ago

March 27, 1924

Sir Edward Mackay Edgar, writing in Sperling's Journal, says that in or before 1934 the United States will be forced to buy from British companies operating outside of the United States 500,000,000 bbls. of crude oil per year. The reason given is that the United States will have depleted most of its oil reserves by that time. Sir Edgar prophesies that the price exacted by the British may be $2 per barrel.

"Experts" in the United States place the oil reserves of the United States at 8,236,000,000 bbls., of which 4,000,000,000 bbls. may be classified as oil in sight; 3,500,000,000 bbls. as prospective and possible heavy oil production, and 4,700,000,000 bbls. of oil of moderate or high gravity, prospective and possible.

(Editor's Note: Since the above estimate was made the United States has produced in nine years 7,775,643,000 bbls. of crude and has more oil in sight than it had 10 years ago.)

H. D. EASTON, geologist of Shreveport, La., has returned from a business trip to Cuba, making the journey by air.

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W. L. MACKENZIE, JR., formerly with the International Petroleum Company in Peru, is on a vacation in England from British Colombia.

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H. R. CULLEN, independent oil operator, Houston, Tex., and MRS. CULLEN, have returned from an extended pleasure trip in New York.

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GEORGE H. SHELDON, of New York, widely known among advertising executives in the oil business, was a week-end visitor in Oil City, Pa.

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CYRUS WILLIAMS, who has been in charge of the Kansas district for Smith Separator Company, has been brought to the general offices in Tulsa.

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N. K. POTTER was re-elected secretary of the Mount Diablo Oil, Mining & Development Company at the annual meeting held recently in Los Angeles.

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W. T. WALLACE, vice president of the Venezuela Gulf Oil Company, New York, is now on a two months' inspection trip to the company's South American properties.

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JAMES H. HERBERT, with Standard Oil Company of Ohio, has been appointed to membership on the American Petroleum Institute committee on fire prevention in refineries.

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JOHN R. SCOHY, superintendent of the Okmulgee Producers & Manufacturers Gas Company, has received a patent from the U. S. Government on a working barrel valve release.

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SIR HENRI W. A. DETERDING, K.B.E., general managing director of the Royal Dutch Petroleum Company, has returned to London, England, after his vacational sojourn at St. Moritz.

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A. L. LOMMEL, of Bartles-Shepard Oil Company, of Waterloo, Iowa, is the new president of the Iowa Petroleum Association. He was elected at the recent convention in Des Moines.

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RICHARD ROLLINS, European representative of the Atlantic Refining Company, returned to England last week on the Ile De France of the French line after a visit to the Philadelphia, Pa., offices of the company.

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JAMES CALDWELL, JR., vice president of the Warner-Caldwell Oil Company, and who resides at Titusville, Pa., has been a visitor in Nowata and Rogers Counties, Oklahoma.

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DR. E. R. REDGROVE, managing director of Snowdon, Sons & Company, Ltd., and president of the National Lubrication Oil and Grease Federation, London, England, left for Egypt this week, and will return next month.

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C. L. HENRY, chief engineer of Lee C. Moore & Company, Pittsburgh, Pa., and four other members of the engineering department, including CECIL JENKINS, H. E. LETTILL, O. W. OSCHMAN and J. J. FEICHT, visited in Central Michigan fields recently with BERT SUTHERLAND, eastern representative, acting as host.

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MISS ANONA BERYL SCOTT, daughter of MR. and MRS. J. N. SCOTT, of Petrolia, Ontario, and JOHN W. SUTHERLAND, of Talara, Peru, son of MR. and MRS. A. V. SUTHERLAND, of Oil Springs, were married at Talara on February 23. After an airplane trip to Lima, they have taken up their residence at Talara, where Mr. Sutherland is employed with the International Petroleum Company.

He's Been in Gas Business 35 Years

Alfred Hurlburt, recently made vice president and general manager of operations for the Republic Gas Corporation and associated companies of Houston, Tex., has been in the gas business 35 years. After attending the public schools of Philadelphia, Pa., he entered Cornell University. Following his graduation he was employed as a gas engineer in Jersey City, N. J. In 1901, Mr. Hurlburt entered the service of the United Gas Improvement Company in Philadelphia and a few months later he was made superintendent of the company's gas plant in Yonkers, N. Y.

ALFRED HURLBURT

The next year Mr. Hurlburt returned to Philadelphia to become assistant to the superintendent of the works of the United Gas Improvement Company. His duties here required him to visit various properties of the company, report improvements and extensions needed and suggest better methods of operation. In 1906 Mr. Hurlburt went to Kansas City, Mo., at that time dependent upon manufactured gas, and he was made assistant engineer of the Kansas City Gas Company. Soon afterward he became engineer and manager. He continued in the service of the company till 1920.

On May 1, 1920, Mr. Hurlburt became vice president and general manager of the Philadelphia Company in Pittsburgh, Pa., and its subsidiary oil and gas companies. After eight years in this position he took up general consulting work in Philadelphia, and in 1930 went to Chicago with Central Public Service Company as engineer and advisor in natural gas, and was in charge of the introduction of natural gas in a number of southern cities, Atlanta, Anniston, Macon and Gadston and was also consultant of Washington Gas & Light Company in the use of natural gas as an enricher of manufactured gas.

During this time he was vice president of Central Natural Gas Company with offices at Lexington and planned and started a pipe line from eastern Kentucky to Muncie, Ind., but a contract made with Panhandle Eastern caused same to be abandoned.

The Republic Gas Company subsidiaries, which he has charge of, consist of the Argus Production Company and Missouri Valley Gas Company, the largest producing company and marketing company in the Hugoton Field of Kansas; the Saxet Gas Company with operations in the neighborhood of Corpus Christi; Saxet Oil Company with gas and oil production in the Refugio Field of Texas; also Saxet Sand & Gravel Company at Victoria, Tex., where there is one of the largest deposits of sand and gravel in the State; and the Corpus Christi Warehouse Company that takes care of the goods shipped to that center by boat lines.

Mr. Hurlburt has been a director of the American Gas Association.

O. W. PETERSON, head of the Century Oil Company, has been elected president of the Fort Worth Independent Petroleum Marketers Association. Other officers are: J. C. GAITHER, vice president, and H. C. HILDEBRANDT, treasurer. The officers and W. R. CHILDRESS and P. HANSON compose the executive committee.

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FREDERICK J. WOLFE, chairman of the Anglo-American Oil Company, Ltd., gave a dinner to eight of his colleagues: J. WILKIE FRYE, A. MACLEAN, H. KEMP, E. W. B. NICHOLAS, G. E. FULSTOW, H. C. FEATHERSTONE, A. M. MONTGOMERY and E. C. MOREY, on the occasion of their retirement under the company's pension scheme.

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A. J. (WHITEY) WEIDEMAN, one of Michigan's "twin" oil umpires, has recovered from an illness which kept him in bed several days last week. "Whitey," a former drilling contractor in Ohio fields before he came to Michigan as a Muskegon and later a Mount Pleasant contractor, works with O. H. WHITE, nearly his double in stature, weight and build, in keeping Michigan operators in line under drastic proration schedules which have been in effect for several months.

D. J. SWEENEY, president of the Lesuer Oil Corporation, of Buffalo, N. Y., spent last Friday in Oil City, Pa.

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J. PEVSNER, chairman of Russian Oil Products, has left England for South Africa. He is expected to be away for several months.

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GLENN M. TRIPLETT, sales manager of the Sterling Oil Company, at St. Marys, W. Va., was a business visitor to Oil City, Pa., last week.

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J. B. FROST, of Farmington, N. Mex., representative of the United States Geological Survey, is recuperating from an operation for appendicitis.

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C. M. SUTHERLAND, secretary of the Nebraska Petroleum Marketers, Inc., has returned to his duties after being away because of an eye operation.

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A. J. HAZLETT, editor of the Inland Oil Index, of Casper, Wyo., and a member of the Wyoming committee under the code, was a Denver, Colo., visitor this week.

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JAMES A. MOFFETT, recently elected vice president of the Standard Oil Company of California, is visiting various centers in Europe, and was recently in London, England.

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ROBERT HEAL, of Mooretown, Ontario, sailed last week for Persia under drilling contract for the Shell Oil Company. Mr. Heal returned two years ago after 10 years' drilling in the Borneo fields.

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W. J. LOFTIS, formerly with the Prairie Oil & Gas Company at Amarillo, Tex., is now a member of the legal staff of DON EMERY, chief counsel for Phillips Petroleum Company in Texas.

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DEAN E. WINCHESTER, consulting engineer, of Denver, Colo., is setting up a laboratory at Artesia for the testing of potash samples from wells being drilled by the Texas Potash Company, of which he is an officer.

* * *

VERNON SMITH has been appointed general manager of the Shell Company for Australia and New Zealand, in succession to O. W. DARCH, who returned to London, England, recently to take up an appointment in the Shell head offices. Mr. Smith has been assistant general manager for the last three years.

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JOHN E. SELDEN, son of COL. and MRS. E. V. D. SELDEN, of Oil City, Pa., has been elected a director of South Penn Oil Company to fill the vacancy left by the late R. W. CUMMINS. Mr. Selden joined the legal department of the South Penn company in May, 1930. In October of 1930 he was made assistant secretary. Colonel Selden recently retired from partner-ownership of Crystal Oil Works at Oil City to devote his time to producing properties.

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P. MESSENGER, manager of operations for the Continental Oil Company of Mexico; J. L. TATUM, chief geologist with the same company, both of Monterrey; E. J. NICKLOS, vice president in charge of production for Continental Oil Company; H. K. V. TOMPKINS, manager of the land and exploration department; W. E. HAGGARD, general land superintendent; G. C. CLARK, chief geologist; L. F. ATHY, geologist, all of Ponca City, Okla.; A. E. BRAINERD, geologist of Denver, Colo.; A. K. TYSON, San Antonio, Tex.; T. W. MADGETT, land superintendent for the Houston district, and R. PAXSON, geologist, both of Houston, Tex., have been in the Fort Worth, Tex., office of the Continental Oil Company spending a couple of busy days.

Oklahoma Fields

(Continued from Page 132)

a location for No. 1 Billington, SW cor. Section 31-7-5.

In the Holdenville area, Hughes County, Phillips Petroleum Co.'s No. 1 Narcome, SW SE SW Section 9-7-8, flowed 51 bbls. from sand at 2,952-75 feet which had shown 7,000,000 feet of gas in the top of the sand.

Watkins Drilling Co. completed No. 2 Jacobs, SE NW NE Section 16-7-8, which had swabbed 170 bbls. in 24 hours from Booch sand at 2,895-2,944 feet.

Dundee Oil Co. will deepen No. 1 Pickens, NE cor. Section 21-7-8, which swabbed 30 bbls. a day from sand at 3,060-90 feet, total depth 3,137 feet.

Royce and others completed No. 6 Walker, SW NE SW Section 22-7-8, a 25-bbl. well from Calvin sand at 1,146-72 feet.

Winona Oil Co. and Jarvis & Holm had rig up for a Wilcox sand test, No. 1 Myers, SE SW NE Section 31-7-8.

Deep Rock Oil & Gas Co. and Margay Oil Co.'s wildcat test in Pottawatomie County, No. 2 Adams, NW cor. NE Section 11-6-3, was dry and abandoned at 3,805 feet.

Amerada Petroleum Corp.'s No. 1 Jones, SE NW Section 5-6-5, had Simpson sand at 4,087 feet, and dolomite at 4,153 feet. The oil pay came at 4,184-88 feet, total depth. It swabbed 180 bbls. in 19 hours and was to be acidized.

Among the Wildcats

In Kay County, Argo Oil & Gas Co. was digging cellar for No. 1 Freese, SW NE NW Section 30-25-1w, and the same company was rigging up rotary for No. 1 Dickman, SW cor. SE Section 13-24-3w. Ross Cummings and others were rigging up standard tools to start No. 1 Gage, SE cor. NW Section 27-22-3w. Garfield County. Indian Territory Illuminating Oil Co. was drilling at 6,430 feet in No. 1 Clark, C NW NW Section 34-21-6w, Garfield County.

Anderson & Kerr were drilling out plugs to deepen No. 1-A Hull, 455 feet from the north line and 330 feet from the east line, SE Section 11-18-4w, Lincoln County.

Mid-Kansas Oil & Gas Co. has resumed drilling its deep test in Caddo County, No. 1 Yule, SE cor. SW Section 1-5-9w. It was drilling at 5,121 feet.

Pontotoc County

Davis Drilling Co. completed a 5-bbl. well, No. 1-A Taylor, SW NE SE Section 29-5-5, total depth 2,343 feet.

H. & M. Drilling Co.'s No. 1 Adams, SE NW NE Section 25-5-8, was abandoned at 905 feet, and Michaelson and others' No. 1 Wallace, NE SE NW Section 29-5-8, was abandoned at 525 feet.

George Fisher's No. 1 Munson, SE NE NW Section 30-2-9w, Stephens County, was dry and abandoned at 2,136 feet. It penetrated a number of sands but none of them showed oil or gas in paying quantity.

Galbreath's No. 1 Stafford, NE SE SE Section 31-2-6, Pontotoc County, was dry and abandoned at 1,378 feet.

In the Fitts Pool

In the Fitts Pool, Magnolia Petroleum Co. was building rig for No. 1 Norris, NW SE SE Section 18-2-7.

Manahan Drilling Co.'s No. 1 Norris, C SE NW SE Section 18-2-7, found sand at 1,747-73 feet. The swab brought up 80 bbls. in eight hours but the hole refilled 1,200 feet with oil over night. The same company, which opened the shallow sand production in this pool in its No. 1 Reynold-Wagner, C SW NE SE Section 18-2-7, swabbed and flowed 318 bbls. in 24 hours from the discovery well and later 187 bbls. in 24 hours. It may be deepened.

Blackstock and others' No. 1 Lewis, C NE NE SE Section 19-2-7, found a hard sand at 2,112-15 feet with a showing of gas and was drilling at 2,120 feet. This test found the 1,700-1,800-foot horizon dry. It had sands at 1,751-65 feet and 1,785-1,835 feet.

Moore & Deaner's No. 1 Edwards, C NW NE SE Section 27-2-8, Coal County, found a stain of oil in sand at 1,915-35 feet. It has had sands at 1,015-64 feet, with a showing of gas; dry sand at 1,090-1,120 feet, 1,310-35 feet, and 1,376-99 feet; a showing of gas at 1,392-1,445 feet. This and other tests are being drilled in the expectation of extending the Fitts Pool easterly into Coal County. Westheimer & Daube's No. 1 Lowman, C NE SE Section 18-2-8, was drilling at 2,320 feet. It, too, has found numerous sands on the way down, all of them dry. Gilcrease sand at 2,005-26 feet and a sand at 2,230-2,300 feet were the deepest sands reported thus far. Fink & Russell's No. 1-A Miller, C SE SE NE Section 10-2-8, an old well drilled deeper, was abandoned at 2,950 feet. It had a showing of gas in sands at 2,060-2,100 feet and 2,362-68 feet, but no sands were reported from that on to the bottom.

Delaney and others completed No. 1 Hardin-A, NW cor. Section 30-2-7, good for 150 bbls. per day or more. This well got production in the Hunton lime in which formation E. H. Moore and others opened the field to production. In the Delaney well Hunton was found at 3,686 feet; Sylvan at 3,960 feet, total depth 3,962 feet. The Hunton lime was acidized and the well responded with 280 bbls. of 40 gravity oil in nine hours.

In Southern Counties

Dandridge and others have a machine in for a wildcat test, No. 1 Stafford, NW cor. Section 5-1n-6e, Pontotoc County.

In Jefferson County, Lang and others' No. 11 Seay, 180 feet north and 930 feet east of C Section 3-7-5w, is a 40-bbl. completion from sand at 1,096-1,113 feet. It also produced 20 bbls. of water per day. Rig is up for No. 12, 100 feet south and 1,509 feet east of C Section 3-7-5w.

Brookshire and others' No. 1 Rowland, NW NE NE Section 18-3s-10e, had 700 feet of fluid in the hole, 400 feet of which was free oil from Wilcox sand at 3,487-98 feet. Casing will be set at 3,482 feet and the operation was shut down awaiting the pipe. This test had Mayes lime at 2,160 feet; Sycamore at 2,292 feet; Woodford at 2,295 feet; Sylvan at 2,585 feet; Viola at 2,715 feet; Simpson at 2,805 feet; a water-bearing stratum at 3,086-3,100 feet.

In Stephens County, Graham & Gilbert completed a 9-bbl. well in No. 1-A Ferris, SE NW NW Section 27-2s-6w, at 1,888-1,920 feet.

L. Sykes' No. 1-A Cash, C SW NE SE Section 17-1s-6w, was dry and abandoned at 3,755 feet.

In Carter County, the Daphine Oil Co.'s No. 5 Majors, NW SE SE Section 25-1s-3w, swabbed and flowed 1,011 bbls. in 24 hours from a sand series at 2,455-2,630 feet.

Carter County

K. D. Oil Co. and others' No. 3 Burton, SW cor. Section 30-1s-2w, was acidized in broken sand at 2,450-2,605 feet and swabbed 300 bbls. in 24 hours.

Salome Oil Co. and Cooper Drilling Co. have rig up for No. 1 West, NW SW SE Section 13-1s-3w.

IMPORTANT BOOKS
for the Oil Man's Library

"CHEMICAL REFINING OF PETROLEUM"

This excellent and outstanding book by V. A. Kalichevsky and B. A. Stagner, just issued, deals with the action of various refining agents and chemicals for the manufacture of commercial petroleum products.

Several books relating to petroleum refining have appeared; these have discussed the subject largely from the standpoint of physical conditions; heat and liquid flow, distillation and the cracking art have been well covered. But this book presents information which explains chemical changes. Such data are not easy to locate, being scattered through the literature and the many patents.

The authors have had the benefit of practical experience through their association with large refining units, the Socony-Vacuum Corp. and the Union Oil Co. of California. Many processes are explained with the care and in the detail only possible by those who are thoroughly acquainted with the operation.

The book, 6¼x9¼, of 451 pages, is well printed, and the subjects are presented in 13 chapters, with supplements describing the patents, special tables and a glossary. A mention of the main subject divisions of this book will serve to indicate the wealth of information that is made readily available. These are: Treatment with sulphuric acid, alkaline reagents, sweetening and elimination of elementary sulphur, adsorption, and solvents in refining. All known methods for sulphur control are described. Other subjects relating to use are: Detonation, antiknock agents, inhibitors, gum, and deterioration of lubricating oils.

This treatise contains so much useful information that no adequate report of its contents is possible in a short review. A brief outline of several chapters is given by way of example.

The importance of sulphuric acid as a treating agent is recognized by the 84 pages devoted to the subject of sludge and acid recovery. Under the chemistry of the sulphuric acid treatment the action on paraffins, naphthenes, aromatics, unsaturated hydrocarbons, resinous and asphaltic substances is discussed.

The classification of the products requiring sulphuric acid treatment includes: Light distillates, lamp oils, lubricating oils, wax and the special products, such as solvents, medicinal oils, soluble oils, transformer oils and tree sprays. The influence of different strengths, quantity and temperature of acid is given in considrable detail, and demonstrated by reports of experiments and practical operations.

The sections on the treatment with alkaline reagents, sweetening, adsorption and solvents are especially complete. These include, in addition to the doctor treatment, sodium carbonate, ammonia, lime, magnesium hydroxide, sodium silicate, soaps, hydrochlorite, alcohols, copper, cadmium, sulphur dioxide, percolation, contact filtering and the special solvents mentioned in recent patents.

The material relating to knock rating shows the progress made from the early investigations of Ricardo and others to the present octane standard. The influence of the several knock inhibitors is explained. An excellent chapter is one relating to gums.

This book is a notable contribution to the literature on modern refinery practice. It fills a very definite need in a manner which refinery executives, chemists and technologists will be quick to appreciate; the reliable information it contains will be found invaluable for use in every refinery.

"Chemical Refining of Petroleum" may be purchased through the Book Department of The Oil and Gas Journal at the regular postpaid price of $7, payable by check or money order before book is forwarded.

Southwest Short Course Program at Norman, Okla.

(Continued from Page 148)

Period 7—4 to 5 p.m.

Inspection of Laboratories: Fluid Meter Tests.—A.S.M.E.; Regulator Freezing Problems, sponsored by A.G.A.

Annual banquet, Wednesday night at 6 o'clock, Christian Church.

Thursday Morning, April 26

8 to 11 a.m.

General Assembly: Auditorium, third floor, W. R. McLaughlin, presiding.

1. Announcing of Prize Papers, W. R. McLaughlin, Arkansas Natural Gas Corp.
2. College of Engineering and the Gas Measurement Short Course, J. H. Felgar, dean of the College of Engineering.
3. Paper: Prepared by R. S. J. Pigott, chairman of Fluid Meters Committee A. S.M.E., presented by D. A. Sillers, Lone Star Gas Co.
4. Paper: J. J. Hassler, gas and electric engineer of the Oklahoma Corporation Commission.
5. Paper: Prof. W. H. Carson, director, School of Mechanical Engineering.
6. Address: R. W. Hendee, president, Oklahoma Natural Gas Corp.

Thursday Afternoon, April 26

Period 8—1 to 2 p.m.

(a) Bell Prover Operation, Pittsburgh Equitable Meter Co., J. H. MacLean.

(b) Foxboro Pressure Controls, G. B. Lane.

(c) Large Capacity Positive Meters, Metric Metal Works of American Meter Co.

(d) Practical Operation and Installation of Recording Temperature Gauges, R. L. Roundtree, United Gas Co.

(e) Determination of Line Losses, (1) High Pressure Lines, Earl Kightlinger, Arkansas-Louisiana Pipe Line Co.; (2) Low Pressure Lines, R. W. Parker, Oklahoma Natural Gas Corp.

(f) Chaplin-Fulton Regulators, Thomas H. Thorn.

(g) Problems of Elementary Gas Laws, E. F. Dawson, University faculty.

Period 9—2 to 3 p.m.

(a) Bell Prover Operation, American Meter Co., J. C. Diehl.

(b) High Pressure Regulators, Pittsburgh Equitable Meter Co., J. H. Baker.

(c) Care and Operation of Orifice Meters, L. G. Rheinberger, Sinclair Prairie Oil Co.

(d) Practical Meter and Regulator Stations, R. M. Scofield, Lone Star Gas Co.

(e) Domestic Meters (Ironclad), W. J. McArt.

(f) Calculation of Orifice and Positive Meter Charts, R. O. Cox, Lone Star Gas Co.

Period 10—3 to 4 p.m.

(a) Low Pressure Regulators, Pittsburgh Equitable Meter Co., W. J. McArt.

(b) Gravitometer, Refinery Supply Co., H. F. Goodenough.

(c) Operation of Slide Rule and Gas Rule, H. V. Beck, University faculty.

(d) Domestic Meters, Sprague Meter Co., H. A. Kahler.

F. M. SYKES DIES

Frank M. Sykes, tax agent for the Texas Co. in the Rocky Mountain area, died of a heart attack in Denver the past week. He was born in Aberdeen, Miss., and came to Denver 16 years ago.

Oklahoma-Kansas and Eastern Monthly Pipe Line Report

OKLAHOMA-KANSAS PIPE LINE STATEMENT FOR JANUARY

Runs

Company—	Month (bbls.)	Dly. av. (bbls.)
Gulf Pipe Line Co.	1,139,792	36,768
Texas P. L. Co.	629,730	20,314
Empire P. L. Co.	1,860,880	60,028
Magnolia P. L. Co.	1,514,382	48,851
Cosden P. L. Co.	684,272	22,073
Stanolind P. L. Co.*	2,479,224	79,975
Oklahoma P. L. Co.	2,478,156	79,941
Other lines*	7,874,000	254,000
Total January	18,660,437	601,950
Total December	18,290,879	590,029
Difference	369,558	11,921

Shipments

Gulf P. L. Co.	1,008,188	32,522
Texas P. L. Co.	1,050,162	33,876
Empire P. L. Co.	1,837,562	59,266
Magnolia P. L. Co.	1,144,256	36,911
Cosden P. L. Co.	686,959	22,160
Stanolind P. L. Co.†	3,765,570	121,470
Oklahoma P. L. Co.	2,341,384	75,529
Other lines*	7,750,000	250,000
Total January	19,583,771	631,734
Total December	18,909,577	609,986
Difference	674,194	21,748

Stocks

	Bbls.
Prairie O. & G. Co.*	31,210,000
Gulf P. L. and Gypsy Oil Co.	7,608,451
Texas Co.	5,522,800
Empire P. L. Co.	5,667,040
Mid-Continent Petroleum Corp.	2,526,275
Stanolind Crude Oil Pur. Co.*	14,060,000
Magnolia Petroleum Co.	6,907,441
Oklahoma P. L. Co.	1,279,504
Carter Oil Co.	2,737,704
Other lines*	22,272,000
Total January	99,791,215
Total December	98,450,501
Difference	1,340,714

*Estimated. †Stanolind Pipe Line Co. shipments include Texas crude oil.

EASTERN PIPE LINE REPORT FOR MONTH OF FEBRUARY

Runs From Wells

In the following table will be found the regular receipts from wells by various pipe lines in New York, Pennsylvania, West Virginia, Ohio, Kentucky, Illinois, Indiana and Michigan for January and February:

	Jan., 1934	Feb., 1934
Nat. Transit	278,749.97	205,751.41
S. W. Pa. P. L.	75,988.91	59,190.33
Eureka P. L.	273,049.30	229,691.02
Buckeye P. L. (Macksburg)	245,154.06	198,915.31
Buckeye P. L. (Cleveland)	9,246.22	6,952.70
Buckeye P. L. (Lima, etc.)	67,797.83	43,655.12
Stoll Oil Ref.	26,547.00	21,301.00
Bradford Tran.	444,388.14	368,836.94
N. Y. Transit	35,588.40	27,192.48
Tide Water P. L.	23,153.05	22,311.02
Pure Oil	630,500.24	628,885.60
Daugherty Ref.	586.00	586.00
Valvoline Pipe	74,941.32	59,737.57
Other companies	297,037.98	218,128.85
Total	2,282,728.42	2,090,945.35
Daily average	73,636.21	74,676.62

Petroleum Deliveries

The following tables exhibit the shipments or regular deliveries of various pipe lines in New York, Pennsylvania, West Virginia, Ohio, Kentucky and Indiana for January and February:

	Jan., 1934	Feb., 1934
Nat. Transit	542,763.21	425,306.56
S. W. Pa. P. L.	418,931.64	469,070.43
Eureka P. L.	246,234.08	204,643.89
Buckeye P. L. (Macksburg)	257,703.63	165,969.90
Buckeye P. L. (Cleveland)	1,705.05	974.81
Buckeye P. L. (Lima, etc.)	1,133,264.10	1,081,241.73
Indiana P. L.	792,461.30	832,564.65
Bradford Tran.	408,669.69	371,335.74
Southern P. L.	31,421.86	5,467.01
Tuscarora Dev.	239,176.13	167,133.97
N. Y. Transit	185,509.24	146,828.75
Northern P. L.	121,855.53	43,309.33
Tide Water P. L.	415,887.18	369,347.70
Pure Oil	676,360.69	615,042.61
Valvoline P. L.	44,347.39	38,277.33
Other companies	201,638.72	173,578.99
Total	5,717,929.44	5,110,098.40
Daily average	184,449.66	182,503.51

Gross Stocks

The gross stocks held by various pipe lines in the oil-producing sections of New York, Pennsylvania, West Virginia, Ohio, Indiana and Kentucky at the close of January and February:

	Jan., 1934	Feb., 1934
Nat. Transit	368,381.07	344,175.68
S. W. Pa. P. L.	433,315.95	423,472.79
Eureka P. L.	915,898.39	912,320.34
Buckeye P. L. (Macksburg)	255,911.45	311,574.10
Buckeye P. L. (Cleveland)	36,849.02	37,163.19
Buckeye P. L. (Lima, etc.)	2,579,372.54	2,517,130.76
Indiana P. L.	441,369.61	426,112.99
Bradford Tran.	325,421.64	323,069.13
Southern P. L.	110,300.44	107,585.16
Tuscarora	5,533.44	5,571.53
N. Y. Transit	91,784.99	100,631.96
Northern P. L.	197,530.00	170,680.78
Tide Water P. L.	759,485.55	773,671.89
Pure Oil	862,546.51	786,465.15
Valvoline	125,698.85	110,817.17
Other companies	106,159.52	93,408.66
Total	7,615,558.77	7,443,792.28
Increase	149,161.43	
Decrease		171,766.49

Grades of Oil

The following table shows the amount of the different grades of oil held by the Eastern pipe lines at the close of January and February, showing gross stocks of the above fields:

	Jan., 1934	Feb., 1934
Pennsylvania	2,530,257.89	2,441,275.74
Lima	406,396.17	352,836.53
Kentucky		
Mid-Continent	4,281,792.36	4,359,219.74
Illinois	616,220.06	593,916.21
Michigan	804,725.72	748,432.43
Total	8,639,392.20	8,495,680.65

Daily Average Runs

The following table shows the daily average runs of the Pennsylvania, Lima and Kentucky oil fields for the past four years:

	1931	1932	1933	1934
Jan.	53,939	53,501	64,493	73,636
Feb.	55,163	55,498	58,140	74,677
Mar.	54,331	57,199	59,417	
Apr.	54,914	57,348	61,812	
May	53,314	59,105	65,755	
June	54,110	64,371	67,370	
July	50,722	63,402	68,100	
Aug.	51,503	67,676	77,537	
Sept.	61,345	65,422	83,193	
Oct.	65,595	65,960	84,636	
Nov.	59,819	60,602	85,391	
Dec.	61,835	57,401	72,257	

Daily Average Shipments

The following table gives daily average shipments from the Pennsylvania, Lima and other fields for the past four years:

	1931	1932	1933	1934
Jan.	175,269	186,551	198,996	184,450
Feb.	183,494	189,856	187,928	182,504
Mar.	189,508	188,793	183,632	
Apr.	191,450	202,036	181,940	
May	199,247	201,404	199,671	
June	221,155	201,632	211,980	
July	211,632	202,859	213,417	
Aug.	224,166	187,839	211,123	
Sept.	217,537	170,524	213,913	
Oct.	210,531	188,504	214,362	
Nov.	196,425	189,626	207,432	
Dec.	176,241	186,135	173,884	

Gross Stocks

In the following table will be found the gross stocks of the various lines of the Pennsylvania, Lima and Kentucky oil fields, including oil received from other lines at the close of each month for the past three years:

	1932	1933	1934
Jan.	9,023,914	7,608,270	7,615,559
Feb.	8,974,350	7,302,746	7,443,792
Mar.	8,802,192	7,279,843	
Apr.	8,908,461	7,212,548	
May	8,835,726	7,016,621	
June	8,732,724	6,766,038	
July	8,176,956	6,713,942	
Aug.	8,128,576	6,617,276	
Sept.	7,895,421	6,601,134	
Oct.	7,421,620	6,852,809	
Nov.	7,116,200	7,124,944	
Dec.	7,130,420	7,466,397	

Illinois Pipe Line

The following table gives the report of the Illinois Pipe Line Co. in Illinois:

Gross stocks, Feb. 28	583,594.66
Runs from wells	360,899.01
Other receipts	16,302.19
Regular deliveries	309,405.58
Other deliveries	91,978.87

Average Daily Imports of Crude and Refined Oil at Principal United States Ports

Average barrels per day in 1933-34—	Atlantic Ports: Baltimore	Boston	New York	Philadelphia	Others	Total	Gulf Coast Ports: Galveston	New Orleans, Baton Rouge	Port Arthur, Sabine Pass	Tampa	Total	Total all ports
February	7,682	4,789	120,490	12,610	10,822	156,393	.....	.....	.....	.....	2,357	158,750
March	7,710	4,290	101,258	36,292	16,000	165,290	.....	.....	.....	.....	.....	165,290
April	10,000	6,700	73,433	33,267	9,967	132,367	.....	.....	.....	.....	.....	132,367
May	4,258	3,194	62,484	32,548	3,355	94,839	.....	.....	.....	.....	4,355	99,194
June	4,833	.....	46,967	29,967	5,233	87,000	.....	.....	.....	.....	.....	87,000
July	10,845	3,452	91,258	33,161	2,968	140,484	.....	.....	.....	.....	6,194	146,678
August	13,774	3,452	112,193	33,484	6,742	168,645	.....	.....	.....	.....	2,161	170,806
September	7,667	.....	51,733	27,733	3,267	90,400	.....	.....	.....	.....	.....	90,400
October	7,613	1,516	60,581	23,967	.....	93,677	.....	.....	.....	.....	1,452	95,129
November	11,533	1,900	71,700	14,534	2,600	102,267	.....	.....	.....	.....	1,966	104,233
December	8,871	.....	77,258	29,161	7,677	122,968	.....	.....	.....	.....	6,419	129,387
January	11,387	.....	71,548	27,323	4,452	114,710	.....	.....	.....	.....	2,193	116,903

Average Daily Receipts of California Crude and Refined Oil at Atlantic and Gulf Ports

Average barrels per day in 1933-34—	Atlantic Ports: Baltimore	Boston	New York	Philadelphia	Others	Total	Gulf Coast Ports: Galveston	New Orleans, Baton Rouge	Port Arthur, Sabine Pass	Tampa	Total	Total all ports
February	9,106	1,643	14,250	10,965	11,500	47,464	.....	.....	.....	.....	2,643	50,107
March	5,065	.....	16,516	9,968	13,935	45,484	.....	.....	.....	.....	7,484	52,968
April	6,000	.....	14,600	7,733	4,934	33,167	.....	.....	.....	.....	4,900	38,067
May	4,194	.....	15,355	14,293	5,871	39,613	.....	.....	.....	.....	4,452	44,065
June	1,267	.....	5,300	11,767	7,667	26,000	.....	.....	.....	.....	4,938	30,938
July	3,773	.....	17,323	34,097	15,194	60,387	.....	.....	.....	.....	.....	60,387
August	3,484	1,742	12,065	15,032	7,129	39,452	.....	.....	.....	.....	.....	39,452
September	3,433	1,600	14,233	11,633	10,400	41,300	.....	.....	.....	.....	1,300	42,600
October	1,806	3,387	26,516	7,484	22,129	61,323	.....	.....	.....	.....	.....	61,323
November	11,666	8,067	33,830	10,803	23,067	87,433	.....	.....	.....	.....	.....	87,433
December	3,032	10,419	41,194	7,419	25,710	87,774	.....	.....	.....	.....	5,032	92,806
January	2,806	13,839	35,516	5,323	29,871	80,356	.....	.....	.....	.....	.....	80,356

Gross Production of Crude Oil in the United States for 12 Months

(In barrels of 42 gallons)

1933—		California	Oklahoma	Texas	Kansas	Arkansas	Louisiana	Rocky Mts.	Eastern	Total
January:	Month	14,460,382	12,575,832	26,116,932	2,871,382	993,457	2,021,117	2,241,610	3,112,000	64,391,512
	Daily average	466,461	405,672	842,449	92,622	32,047	65,197	72,310	100,387	2,077,145
February:	Month	13,107,043	12,592,132	25,092,383	2,801,513	880,208	1,793,443	2,096,612	2,747,000	61,110,333
	Daily average	468,109	449,719	896,156	100,054	31,436	64,052	74,879	98,011	2,182,512
March:	Month	12,414,980	15,479,726	34,242,444	3,604,539	943,702	2,070,695	2,371,469	3,118,000	75,245,555
	Daily average	432,741	499,556	1,104,595	116,276	30,442	66,797	76,499	100,581	2,427,276
April:	Month	14,262,942	11,746,170	27,306,582	3,492,990	909,120	2,156,736	2,308,470	3,017,000	65,101,011
	Daily average	475,431	391,539	910,219	116,433	30,304	71,893	73,649	100,567	2,170,034
May:	Month	14,817,633	13,552,797	29,151,776	3,277,103	928,667	2,116,296	2,294,558	3,177,000	69,315,830
	Daily average	477,986	437,187	1,585,141	105,713	29,957	68,268	74,018	102,161	2,881,156
June:	Month	14,344,654	14,360,910	29,907,737	3,210,150	901,770	2,009,831	2,239,650	3,191,000	80,165,702
	Daily average	478,155	478,697	1,330,258	107,005	30,059	66,994	74,655	106,367	2,672,190
July:	Month	15,140,328	18,406,374	39,031,468	4,068,130	946,926	2,143,314	2,421,720	3,474,000	85,632,780
	Daily average	488,414	593,754	1,259,080	131,230	30,546	69,139	78,120	112,065	2,762,347
August:	Month	15,536,841	18,808,383	37,682,871	3,908,394	971,392	2,201,161	2,436,882	3,850,000	85,476,514
	Daily average	501,188	606,722	1,215,602	126,074	31,333	73,532	78,577	124,194	2,757,307
September:	Month	14,673,846	16,602,890	33,511,172	2,729,000	953,580	2,247,451	2,427,960	3,890,000	78,036,899
	Daily average	489,129	553,463	1,117,039	124,300	31,786	74,915	80,932	129,667	2,601,230
October:	Month	14,665,011	15,031,032	32,914,578	3,287,643	1,017,885	2,316,000	2,500,615	4,090,000	75,822,764
	Daily average	473,065	484,872	1,061,761	106,053	32,835	74,710	80,665	131,936	.....
November:	Month	13,933,559	14,364,030	27,986,117	3,599,400	986,910	2,236,810	2,434,920	3,827,000	69,367,746
	Daily average	464,452	478,801	932,871	119,980	32,897	74,526	81,164	127,567	2,313,258
December:	Month	14,767,800	14,835,174	28,864,592	3,455,725	1,016,118	2,337,811	2,494,477	3,935,000	71,406,697
	Daily average	476,381	478,554	931,116	111,475	32,778	72,189	80,467	126,799	2,303,893
	Total 12 months	173,125,420	178,356,449	401,808,452	41,305,788	11,449,635	25,829,655	28,169,944	41,428,000	901,373,323
	Daily average	474,316	488,648	1,100,845	113,166	31,369	70,218	77,169	113,200	2,469,243

Gulf Coast Fields and Wildcats

(Continued from Page 142)

Sinclair Prairie Oil Co.'s No. 17 Wilburn, 125 ft. N of S line, 150 ft. W of No. 16, H. Griffith League ..... Stuck drill pipe; lime 1,379 ft.; cmtd. to 925 ft.; abnd.

Sun Oil Co.'s No. 15 Wilburn, 405 ft. from E, 50 ft. from W line ..... T.D. 3,717 ft.; lime and shale; W.O.C.

Sun Oil Co.'s No. 16 Wilburn fee, 120 ft. W of No. 15 and 40 ft. from N line of 20-acre tract in William Hodges Sur. ..... Drlg. shale 1,076 ft.

Sun Oil Co.'s No. 18 J. Wilburn, Henry Griffith League, 50 ft. N of S line, 50 ft. E of W line of lease ..... T.D. 4,524 ft.; P.B. 3,929 ft.; T.D. 4,470 ft. sand; T.S. 4,465 ft.; set 9⅝-in. csg. 4,444 ft.; sand showing oil 4,485 ft.; pulling tubing.

Sun Oil Co.'s No. 21 J. Wilburn, Wm. Hodges Sur., 50 ft. N of No. 20 ..... Drlg. rock 1,337 ft.; no returns.

Sun Oil Co.'s No. 4 Higgins, Wm. Hodges Sur., 100 ft. W of No. 2 ..... Drlg. salt 2,574 ft.

Superior Oil Corp.'s No. 2-A Barber (W.O.), Henry Griffith League ..... Base salt 3,195 ft.; T.S. 4,241 ft.; set 6⅝-in. csg. 4,087 ft.

Texas Gulf Prod. Co.'s No. 2 Barber, 514 ft. W, 41 ft. S of NE cor. of lease, Henry Griffith League ..... O.T.D. 4,309 ft.; drlg. 3,357 ft., shale.

Texas Gulf Prod. Co.'s No. 12-B Kirby, Henry Griffith League, 80 ft. S of N line and direct offset of Texas Gulf's No. 3 J. M. Fitzgerald ..... Top salt 1,375 ft.; drlg. shale and lime 3,493 ft.

Texas Gulf Prod. Co.'s No. 8-H Kirby, 333 ft. W of No. 6-H, 70 ft. N of S line, Henry Griffith League (W.O.) ..... T.D. 5,024 ft.; sidetracked at 3,179-5,022 ft.; shot drill pipe at 2,750 ft.; waiting orders.

Texas Gulf Prod. Co.'s No. 4 Wilburn, Wm. Hodges Sur., 330 ft. N of S line, 50 ft. W of E line ..... Drlg. shale and lime 4,006 ft.

Yount Lee Oil Co.'s No. 23 Chambers County, Wm. Bloodgood Sur., 116.9 ft. S of N line and 247 ft. W of E line ..... T.S. 1,449 ft.; drlg. salt 3,251 ft.

Yount Lee Oil Co.'s No. 7 Phillips, offset Sun Oil Co.'s No. 18 Wilburn ..... Drlg. shale and lime 4,404 ft.

Yount Lee Oil Co.'s No. 8 Phillips, Wm. Hodges Sur. .... Derrick.

RABBS RIDGE—FORT BEND COUNTY

Humble O. & R. Co. and Gulf Prod. Co.'s No. 10-A George, 500 ft. E of No. 9-A in J. Rabb Sur. ..... T.D. 5,349 ft.; W.O.C. 5,331 ft.

Humble O. & R. Co. and Gulf Prod. Co.'s No. 11-A George, J. Rabb Sur., 741 ft. SE of No. 10 ..... Derrick.

Humble O. & R. Co.'s No. 24-B Lockwood-Sharp, 1,153 ft. W of No. 18 ..... Drlg. shale 2,967 ft.

Humble O. & R. Co. and Gulf Prod. Co.'s No. 25-B Lockwood & Sharp, 2,882 ft. from E line and 376 ft. from N line of lease, J. Rabb Sur. ..... Derrick.

BIG CREEK—FORT BEND COUNTY

Porter et al's No. 2 Wheat ..... Odor oil 2,528-83 ft.; drlg.; T.D. 2,967 ft.; W.O.C.

C. & R. G. Drlg. Co.'s No. 1 Wheat ..... Sand show gas 3,851 ft.; trying to blow out.

LONG POINT—FORT BEND COUNTY

Oleson et al's No. 1 McFarland ..... T.D. 1,003 ft.; standing.

SUGARLAND—FORT BEND COUNTY

De Walt Oil Co.'s No. 1 Peterson ..... Drlg. shale 4,514 ft.

HIGH ISLAND—GALVESTON COUNTY

Yount Lee Oil Co.'s No. 4 Broussary & Orme, M. Dunman Sur., 129 ft. SW of No. 3 ..... Drlg. hard sand and lime 4,306 ft.

Yount Lee Oil Co.'s No. 39 Cade, N. Fitzsimmons Sur., 1,000 ft. from W line, 580 ft. from S line of lease .... Drlg. shale and lime 4,974 ft.; base salt 4,968 ft.

Yount Lee Oil Co.'s No. 2-B Cade, 170 ft. from N line, 100 ft. from E line of 40-ac. lease, N. Fitzsimmons Sur. ..... Coring sand and shale; showing oil 5,009 ft.

Yount Lee Oil Co.'s No. 2 Mathis, M. Dunman Sur., direct offset No. 1 Spencer ..... Drlg. hard sand and lime 2,293 ft.

Yount Lee Oil Co.'s No. 21 Smith, M. Dunman Sur., 360 ft. from W line, 1,485 ft. from N line of lease .. Drlg. hard shale and lime 4,568 ft.

ARRIOLA—HARDIN COUNTY

Republic-Houston's No. 2-X Arriola fee ..... Bldg. road.

Republic-Houston's No. 7 Arriola fee ..... Rigging up.

BATSON—HARDIN COUNTY

Danciger O. & R. Co.'s No. 2 Hooks, W. Donoho Sur., 330 ft. E of CWL, Blk. 24 ..... Coring shale and sand; show oil and gas 4,510 ft.

SARATOGA—HARDIN COUNTY

Rio Bravo Oil Co.'s No. 98 Jordit, 150 ft. N and 50 ft. W of No. 104 on 128-ac. tract in Jordit Sur. ..... Rigging up.

Seismo Oil Co.'s No. 1 Casewell, 940 ft. S of NW cor. and 660 ft. from E line, B.B.B.&C. Sur. ..... T.D. 3,212 ft.; shut down.

Skinner Oil Co.'s No. 3 Sessler ..... Rigging up.

SOUR LAKE—HARDIN COUNTY

Parr et al's No. 1 Benard, in W.C.R.R. Sur. No. 69 (west edge) ..... Top Dibollensis 6,885 ft.; T.S. showing oil 6,936 ft.; T.D. 6,994 ft.; set 7-in. at 6,886 ft.; W.O.C.

GOOSE CREEK—HARRIS COUNTY

Hoffner & Moore's No. 1 A. A. Wright, 50 ft. N and 50 ft. E of SW cor. of Blk. 7, Wm. Scott Sur., Abst. No. 65 ..... Moving in rig.

Humble O. & R. Co.'s No. 79 Simms-Smith, Wm. Scott Sur., 50 ft. from N line, 150 ft. from W line of most southerly NW cor. ..... Drlg. shale 4,631 ft.

Miramar Oil Co.'s No. 1 Hughes ..... Drlg. hard shale 940 ft.

L. H. Puckett's No. 1 Scott, Wm. Scott Low League, 35 ft. from E line and 45 ft. from S line of 2½-acre tract ..... Derrick.

Sun Oil Co.'s No. 9 Wright, Wm. Scott Sur., 50 ft. from N line, 50 ft. from E line of lease ..... T.D. 4,550 ft.; comp. 290 bbls. through open tubing.

HUMBLE—HARRIS COUNTY

Texas Co.'s No. 47 Stevenson, J. B. Stevenson Sur., 859 ft. E, 457 ft. S of NW cor., Lot 1-A ..... T.D. 2,732 ft.; sidetracking 2,652 ft.; brown shale.

MYKAWA—HARRIS COUNTY

Crown Central Pet. Co.'s No. 2 Minnetex Subd., 135 ft. from W line and 100 ft. from S line of Lot 251, Wm. J. Lovett Sur. ..... Set 7-in. at 4,797 ft.; sidetracking 4,854 ft.

Framer O. & G. Corp.'s No. 1 Minnetex Subd., 193 ft. NE of SW cor. of lease, Minnetex Subd., Wm. Lovett Sur. ..... Location.

PIERCE JUNCTION—HARRIS COUNTY

Rio Bravo Oil Co.'s No. 24-A Settegast, J. Kopman Sur. No. 44, 1,000 ft. S, 200 ft. W of NE cor. of "A" lease.. Broken sand and shale 3,181 ft.; shut down.

Rio Bravo Oil Co.'s No. 26-A Settegast, J. Kopman Sur. No. 44, 1,310 ft. N line, 750 ft. E line of "A" lease ..... T.D. 5,843 ft.; sidetracked 4,250 ft.; coring sandy shale 5,710 ft.

TOMBALL—HARRIS COUNTY

Humble O. & R. Co.'s No. 1 Emil Doege, C. Goodrich Sur., 300 ft. from E line, 466 ft. from S line of 90 acres ..... Drlg. shale 3,192 ft.

Humble O. & R. Co.'s No. 2 J. W. H. Martens, Wm. Hard Sur. No. 377 ..... Drlg. shale 3,468 ft.

Humble O. & R. Co.'s No. 2 L. B. Moody, J. H. Edwards Sur., 817 ft. S of No. 1 ..... T.D. 5,600 ft.; comp. 7 bbls. hour through ¼-in. choke, 3% salt water and mud; 1,982,000 ft. gas.

Humble O. & R. Co.'s No. 2-B Quilter, A. Seneschal Sur., 466 ft. from E line and 2,946 ft. from N line of survey ..... Drlg. shale 3,896 ft.

Humble O. & R. Co.'s No. 1-C Hope Quilter, 660 ft. from N line and 330 ft. from W line of 340-ac. tract in A. Senchall Sur. ..... Drlg. shale 1,610 ft.

Humble O. & R. Co.'s No. 3 Reid, 466 ft. N of S line and 466 ft. W of E line of lease in Goodrich Sur. No. A-305 ..... Location.

Humble O. & R. Co.'s No. 1 Ben Scherer, 1,000 ft. S of NW cor. and 335 ft. E of W line of 135-ac. tract in J. H. Edwards Sur. ..... Drlg. shale 4,458 ft.

Humble O. & R. Co.'s No. 1 E. E. Weaver, C. N. Pillot Sur., 300 ft. S and 473 ft. E of Weaver 22.94-acre tract ..... T.D. 5,565 ft.; W.O.C.

Shell Pet. Co.'s No. 1 W. W. Baker, 440 ft. S of C of N line of lease, J. House Sur. No. 34 ..... Location.

Shell Pet. Co.'s No. 2 W. W. Baker, 630 ft. S of No. 1 and 466 ft. from W line of lease, J. House Sur. No. 34 ..... Location.

Skelly Oil Co.'s No. 1 Schultz, J. H. Edwards Sur., 456 ft. from S line, 404 ft. from E and W lines .... Derrick.

Texas Co.'s No. 1 Sam Lewis, C. N. Pillot Sur., 466 ft. N 1 deg. W and 550 ft. N 89 deg. E of SW cor. of lease ..... T.D. 5,549 ft.; W.O.C.

Texas Co.'s No. 1 Wm. Hirsch, 163 ft. E and 466 ft. N of most westerly SW cor. of lease, J. House Sur. .... Drlg. shale with streaks of sand 4,639 ft.

Texas Co.'s No. 1 Albert Ziegler, 517 ft. E and 155 ft. S of NW cor. of Wm. Hurd Sur., elev. 189 ft. ..... Derrick.

Windsor Oil Co.'s No. 3 Petrich, J. H. Edward Sur., 466 ft. out of SW cor. lease ..... Coring shale and lime 5,444 ft.

ESPERSON—LIBERTY COUNTY

General Crude Oil Co.'s No. 7 Davis (W.O.), Duncan Sur... T.D. 6,873 ft.; P.B. 4,142 ft.; drlg. shale 4,435 ft.

General Crude Oil Co.'s No. 10 Moore's Bluff, M. Duncan Sur., 1,500 ft. from E line and 2,100 ft. from N line of 632-acre tract ..... T.D. 6,534 ft.; P.B. to 4,300 ft.; milling.

HULL—LIBERTY COUNTY

Gulf Prod. Co.'s No. 96 Phoenix, Jesse Devore Sur., 97 ft. from S line and 694 ft. from W line ..... Completed; no report.

Gulf Prod. Co.'s No. 97 Phoenix, 80 ft. N of No. 94 and 50 ft. from W line of lease ..... Drlg. 245 ft.

Gulf Prod. Co.'s No. 98 Phoenix, 1,123 ft. E along N line of Miramar 25-acre tract from NW cor. and 98 ft. N at right angles ..... Derrick.

Houston Prod. Co.'s No. 5 Orgain, Jesse Devore Sur., 100 ft. S of No. 4 ..... Drlg. shale 4,683 ft.

Humble Oil & Ref. Co.'s No. 35 Guedry ..... Drlg. shale 3,085 ft.

Humble Oil & Ref. Co.'s No. 36 Guedry, N offset to Sun's No. 3-A ..... T.D. 5,027 ft.; comp. 37½ bbls. hour through ⅝-in. choke; T.P. 550 lbs., C.P. 1,250 lbs.

Humble Oil & Ref. Co.'s No. 37 Guedry, 50 ft. from S line and 50 ft. from W line of 43-acre tract ..... Drlg. shale 3,348 ft.

Miramar Oil Corp.'s No. 9-A Phoenix, 230 ft. from No. 2 and 299 ft. from No. 3, Devore Sur. ..... Drlg. shale and sand 4,650 ft.

Republic Prod. Co.'s No. 104 Dolbear, J. Devore Sur. .... Shale 2,867 ft.; no report.

Republic Prod. Co.'s No. 121 Dolbear (W.O.) ..... Shale 2,483 ft.; no report.

Sun Oil Co.'s No. 4-A Carr, 196 ft. due W of No. 3, 50 ft. from N line of lease ..... Location.

Sun Oil Co.'s No. 5-A Carr, 50 ft. from N line and 50 ft. from W line of most northerly NW cor. of lease, J. Devore Sur. ..... Drlg. shale 4,698 ft.

Texas Co.'s No. 6 Barrow fee, 383 ft. S, 150 ft. W from NE cor. of tract, Jesse Devore Sur. ..... Drlg. sticky shale 4,624 ft.

Yount Lee Oil Co.'s No. 9 Hooks fee, Jesse DeVore Sur... Drlg. shale and sand; show oil 4,213 ft.

Yount Lee Oil Co.'s No. 10 Hooks fee, Jesse DeVore Sur., 50 ft. out of SE cor. lease ..... Rigging up.

LIBERTY COUNTY

Edgewater Oil Co.'s No. 1 Pickett, C. A. White Sur., 50 ft. from W line in C N and S of 5½-acre tract ..... Coring green shale 3,912 ft.

CONROE—MONTGOMERY COUNTY

Adeltex Oil Co.'s No. 2 Llewelen, R. G. Hamlett Sur., 466 ft. N, 159 ft. W, SE cor. lease ..... T.D. 5,211 ft.; S.D. 4,020 ft.

Alpha Pet. Co.'s No. 3 Allen, N offset to Humble's No. 51 South Texas, L. Smith Sur. ..... T.D. 5,115 ft.; W.O.C.

American Liberty Oil Co.'s No. 1-D Harris, J. A. Davis Sur. ..... T.D. 5,168 ft.; W.O.C.

Bishop Oil Corp.'s No. 2 Rhodes, 466 ft. from W line in center of N and S lines of 25.8 ac. in W. S. Rhodes Sur. ..... T.D. 5,132 ft.; W.O.C.

Gulf Coast Drlg. & Prod. Co.'s No. 14 Keystone Mills .... T.D. 5,149 ft.; comp. for dry gasser.

Gulf Coast Drlg. & Prod. Co.'s No. 21 Keystone Mills, 755 gt. W of No. 20, A. Steele Sur. ..... Spudding.

Harrison & Abercrombie's No. 6 Alexander, John McHorse Sur., 466 ft. from W line and 300 ft. from S line ..... Derrick.

Humble O. & R. Co.'s No. 1-E Cartwright, E offset to Brown & Wheeler's No. 1 Gilbert, J. A. Davis Sur... Drlg. shale 4,741 ft.

Humble Oil & Ref. Co.'s No. 12 C. L. Dobbins, Ransom House Sur., 698 ft. SE of No. 9 ..... T.D. 5,124 ft.; comp. 75 bbls. hour, ½-in. choke.

Humble Oil & Ref. Co.'s No. 5 Griffin, Wilson Strickland Sur., W offset No. 1-B Young ..... Drlg. shale 4,970 ft.

Humble O. & R. Co.'s No. 22 Keystone Mills, A. Steel Sur. ..... Drlg. shale 5,127 ft.

Humble O. & R. Co.'s No. 31 Keystone Mills, A. Steel Sur.. Drlg. shale 3,325 ft.

Humble Oil & Ref. Co.'s No. 26 Madeley ..... Drlg. sand 5,136 ft.

Humble Oil & Ref. Co.'s No. 29 A. A. and D. A. Madeley, 761 ft. SE of No. 12, Ransom House Sur. ..... T.D. 5,121 ft.; W.O.C.

Humble O. & R. Co.'s No. 49 Moore, L. Smith Sur. ..... Drlg. shale 4,163 ft.

Humble Oil & Ref. Co.'s No. 64-A South Texas, 450 ft. from S and 700 ft. W of No. 6 ..... T.D. 5,173 ft.; comp. 16 bbls. hour through ⅛-in. choke.

Humble Oil & Ref. Co.'s No. 62-A South Texas, 933 ft. N of No. 4-A, T. Slade Sur. ..... T.D. 5,197 ft.; comp. 62 bbls. hour, ½-in. choke.

Humble Oil & Ref. Co.'s No. 2-A Young, S offset to Tide Water Oil Co.'s No. 4 American Natl. Bank, W. Strickland Sur. ..... Drlg. shale 1,302 ft.

Pine Tree Oil Co.'s No. 1 South Tex. Dev. Co., T.&N.O. Sur. No. 13, 1,600 ft. W line, 810 ft. S line of Sur. .. T.D. 5,182 ft.; S.D.

South Gulf Oil Co.'s No. 2 E. M. Raugh, T.&N.O. Sur. No. 3, 175 ft. E of center of W line of 20-ac. lease .. T.D. 5,141 ft.; comp. 30 bbls. hour through ¼-in. choke.

Strake Oil Co.'s No. 6 Keystone Mills ..... Derrick.

Sun Oil Co.'s No. 17 Keystone Mills, 438 ft. from N and 1,444 ft. W of No. 9, A Steel Sur. ..... Drlg. shale 1,333 ft.

Texas Co.'s No. 8 Moody, 2,330 ft. from N and 466 ft. from W lines of tract, Ransom House Sur. ..... O.T.D. 5,100 ft.; fishing 62 ft. of screen.

Tide Water Oil Co.'s No. 5 Eichletz, 362 ft. from W and 467 from N lines of lease, Lemuel Smith Sur. ..... T.D. 5,050 ft.; W.O.C.

Tide Water Oil Co.'s No. 16 C. M. Dean, W. C. C. Lynch Sur. ..... T.D. 5,114 ft.; W.O.C.

PORT NECHES—ORANGE COUNTY

Texas Co.'s No. 2 Orange Natl. Bank, Jacob Beaumont Sur., 1,538 ft. W and 200 ft. S of NE cor. of lease .. T.D. 4,874 ft., sand and shale; D.S. test showed 4 thribbles mud and 16 thribbles salt water.

Texas Co.'s No. 2-B Polk, 695 ft. N, 150 ft. S of NE cor. of N. Jacob Beaumont Sur. ..... Drlg. sticky shale 5,682 ft.

LIVINGSTON—POLK COUNTY

Gem Oil Co.'s No. 1 Shrove, 466 ft. from W line and 404 ft. from N line of lease ..... Location.
Gist Oil Co.'s No. 1 Kingsbury County Holding Corp., A. Viesca Sur., 150 ft. N at R/A and 193 ft. E along S line of tract ..... Standing 4,342 ft.
H. B. Owenby's No. 1 Kimes, 330 ft. from N line and 330 ft. from E line of 25-acre lease in A. Viesca Sur. ..... Location.
Reading & Bates' No. 2 Davis-Holmes ..... T.D. 4,333 ft.; W.O.C.
Smith & McDaniel's No. 1 W. B. Munson heirs, 420 ft. from NW line and 296 ft. NE from road in A. Viesca Sur. ..... Set 10-in. at 517 ft.; W.O.C.
J. L. Werby's No. 1 L. G. Howard, 466 ft. from SE line and 466 ft. from SW line of 70-acre tract, A. Viesca Sur. ..... Derrick.

GRETA—REFUGIO COUNTY

Atlantic Oil & Prod. Co.'s No. 3 J. J. O'Brien, 466 ft. from E and 466 ft. from NW lines of lease, J. H. Peoples Sur. ..... Set tubing 4,391 ft., T.D.; comp. 121 bbls. daily through ⅛-in. choke.
Blanco Oil Co.'s No. 4-A J. J. O'Brien, M. J. Ximines Sur., 466 ft. from N line, 910 ft. from E line of 107-ac. lease ..... T.D. 4,400 ft.; 7-in. at 4,378 ft.; comp. 8 bbls. per hour.
Blanco Oil Co.'s No. 2-C J. J. O'Brien, N. S. Crunk Sur., 466 ft. from E line and 510 ft. from S line of 50-acre tract ..... Drlg. shale 4,380 ft.
D. & D. Oil Co.'s No. 1 Fannie Heard, 330 ft. from N and E lines of Lot No. 14 ..... Drlg. 1,830 ft.
Dash & Blanco's No. 1 J. M. O'Brien, Winfield Sur., 466 ft. from S and E lines of 300-acre tract ..... Drlg. 2,200 ft.
Floboots Oil Corp.'s No. 1 M. C. Bauer, 330 ft. N line, 1,724 ft. from W line, J. M. Ximines Sur. ..... Drlg. shale 5,891 ft.
Floboots Oil Corp.'s No. 3-A J. F. Heard, Ximines Sur., 466 ft. from N line and 1,274 ft. from W line of 150-acre tract, 808 ft. E of No. 1 ..... Drlg. 1,314 ft.
Floboots' No. 3-C J. M. O'Brien, 466 ft. from S and W lines of Blk. 10, Smith Subd., E. H. Winfield Sur. .. Rigging up.
Floboots Oil Co.'s No. 4-C J. M. O'Brien, 503 ft. from E line and 466 ft. from S line of Blk. 8, Peoples Sur... Bldg. derrick.
Hewitt & Doughtery's No. 3 Lambert, E. W. Harper Sur... Rigging up.
Humble O. & R. Co.'s No. 3 Fannie Heard, 525 ft. E of most northerly NW cor. of lease and 466 ft. S of most northerly line at R/A, N. S. Crunk Sur. .. Drlg. shale 2,490 ft.
Humble O. & R. Co.'s No. 3 J. F. B. Heard, Peoples Sur., 466 ft. from W line and 933 ft. N of No. 1 ..... Drlg. shale 2,020 ft.
Humble O. & R. Co.'s No. 3-C J. M. O'Brien, Ximines Sur., 270 ft. N 82° 19 ft. W from NE cor. of Blanco-J. J. O'Brien "A" lease, thence at right angles N 7° 41 ft. E 615 ft. ..... Sand, S.O. 4,390 ft.; cleaned self, making 20% drilling fluid; no gauge.
Humble O. & R. Co.'s No. 4-C O'Brien, 697 ft. from N and 1,169 ft. from E lines of 100-acre tract, or 840 ft. E of No. 3-C in Ximines Sur. ..... Location.
Humble O. & R. Co.'s No. 3 Welder, 1,323 ft. from E line and 466 ft. from S line of 752-acre tract in the Winfield Sur. ..... Moving in rig.
Edwin M. Jones' No. 7-A O'Brien, N. S. Crunk Sur. .... T.D. 4,391 ft.; W.O.C.
Nesral Oil Co.'s No. 1 V. E. Heard, 466 ft. N line, 266 ft. W line, M. J. Ximines Sur. ..... T.D. 6,015 ft.; shale; cored oil sand 6,003-13 ft.; 4½-in. csg. at 6,002 ft.; swabbing water.
Stanolind Oil & Gas Co.'s No. 3-A J. M. O'Brien, Peoples Sur., begin at NE cor. of "A" lease, thence W along N line 1,509 ft., thence S at right angles 466 ft., S offset to No. 4-B ..... T.D. 4,403 ft.; W.O.C.
Stanolind Oil & Gas Co.'s No. 4-B O'Brien, Peoples Sur. ..... T.D. 4,387 ft.; est. 100 bbls. daily.
United Prod. Co.'s No. 13 Fox, 933 ft. S of No. 12 and 466 ft. from E line of lease in Hews Sur. ..... Moving in.
United Prod. Co.'s No. 2-A Lambert, E. W. Harper Sur., 466 ft. out of N cor. of lease ..... T.D. 3,520 ft.; W.O.C.
United Production Co.'s No. 7 Lambert, center of N½ of Blk. 4, M. F. Lambert League ..... T.D. 1,220 ft.; W.O.C.

CLAY CREEK—WASHINGTON COUNTY

Sun Oil Co.'s No. 3 Schermer, N. Clay Sur., 330 ft. NW, 330 ft. SW line of lease ..... Drlg. sandy shale and hard sand 3,172 ft.

SOUTH LOUISIANA FIELDS

BLACK BAYOU—CAMERON PARISH

Shell Pet. Corp.'s No. 18 Watkins, 2,515 ft. S, 650 ft. W of NE cor. Sec. 18-12s-12w ..... Coring sticky shale 3,532 ft.

CAMERON MEADOWS—CAMERON PARISH

Burton-Sutton Oil Co.'s No. 3 School Land, 155 ft. N and 2,974 ft. E of SW cor. of Sec. 16-14s-13w ..... T.D. 3,580 ft.; comp. 310 bbls. day through ¼-in. choke.
Humble O. & R. Co.'s No. 5 Cameron Meadows, 2,260 ft. W, 28 ft. S of NE cor. Sec. 21-14s-14w ..... D.S. test 3,931 ft.; showed 15 thribbles oil, gas and sand; W.O.C.; T.D. 3,958 ft.; comp. 492 bbls. per day.
Humble O. & R. Co.'s No. 7 Cameron Meadows, 2,495 ft. W and 155 ft. S of NE cor. Sec. 16-14s-13w..... Derrick.
Humble O. & R. Co.'s No. 1-B Cameron Meadows, 250 ft. W and 2,640 ft. S of NE cor. of Sec. 24-14s-14w... Digging canal.

EDGERLY—CALCASIEU PARISH

Rex. Pet. Co.'s No. 13 Hunter, 465 ft. N, 90 ft. E of SW cor. of SE ¼ ..... T.D. 4,050 ft.; preparing to bail.
Union Sulphur Co.'s No. 1 Hunter, 310 ft. E, 1,360 ft. N of SW cor. SE Sec. 21-9s-11w ..... Heaving shale 5,458 ft.; D.S. stuck; S.D.
Union Sulphur Co.'s No. 1 La Prairie Narrone, 1,061 ft. N, 250 ft. W of SW cor. SW Sec. 21-9s-11w ..... Cavity 2,417 ft.; sand, show oil 3,172 ft.; making D.S. test.

CHOCTAW—IBERVILLE PARISH

Standard Oil Co. of La.'s No. 4 Gay, 2,350 ft. S, 175 ft. E of NE cor. Sec. 52-9s-11e ..... Drlg. gumbo 1,400 ft.

GARDEN ISLAND—PLAQUEMINES PARISH

Texas Co.'s No. 10 Garden Island ..... T.D. 1,875 ft.; abnd.

GUEYDAN—VERMILLION PARISH

Pure Oil Co.'s No. 6 Alliance Trust, 667 ft. E, 1,787 ft. S line of lease, Sec. 34-11s-1w ..... Drlg. red shale and shells 5,186 ft.
Pure Oil Co.'s No. 5 Mulvey, 500 ft. from No. 2 Mulvey, in line with Nos. 1 and 2 ..... T.D. 5,862 ft.; abnd.

HACKBERRY—CAMERON PARISH

Gulf Ref. Co.'s No. 13-A Irwin ..... Drlg. shale 6,105 ft.
Pop Oil Co.'s No. 1 Yount Lee, 3,996 ft. W, 100 ft. N of SE cor. Sec. 19-12s-10w ..... To pump 4,182 ft.
Red Kelly Oil Co.'s No. 1 Duhon, 200 ft. S, 500 ft. E, NW cor. Sec. 27-12s-10w ..... Hard shale and lime 3,115 ft.; shut down.
Texas Co.'s No. 11-B State ..... T.D. 6,092 ft.; preparing to set screen.
Texas Co.'s No. 10-B State, 1,000 ft. E, 200 ft. N of NE cor. Sec. 13-12s-10w ..... T.D. 7,272 ft.; setting whipstock to sidetrack.
Union Sulphur Co.'s No. 1 Barbee est., 1,720 ft. N line, 320 ft. E of SW cor. Sec. 12-12s-10w ..... Drlg. sandy shale 7,808 ft.
Union Sulphur Co.'s No. 7 Humble lease, 1,010 ft. N, 661 ft. E of SW cor. Sec. 12-12s-10w ..... T.D. 6,542 ft. in salt; P.B. 5,447 ft.; drlg. hard lime 5,998 ft.
Yount Lee Oil Co.'s No. 11 Gulf Land, Sec. 14-12s-10w .. Drlg. sand and boulders 1,931 ft.
Yount Lee Oil Co.'s No. 14 Gulf Land ..... Rigging up.

IOWA—CALCASIEU AND JEFF DAVIS PARISHES

Barnsdall Oil Co.'s No. 4 Fontenot, 330 ft. N, 330 ft. W out of SE cor. 30-ac. lease, Sec. 7-9s-6w ..... Coring at 6,681 ft., shale.
Magnolia Pet. Co.'s No. 2 James Bowman, 660 ft. W, 330 ft. N of SE cor. NE SW Sec. 12-9s-7w ..... T.D. 6,435 ft.; S.D.; cellar caved.
Shell Pet. Corp.'s No. 6 Fontenot, Sec. 7-9s-6w, 900 ft. N, 330 ft. W of SE cor. of lease ..... Drlg. hard shale 6,505 ft.
Shell Pet. Corp.'s No. 7 A. D. Fontenot, 990 ft. N and 330 ft. W of SE cor. of lease in Sec. 7-9s-6w ..... Drlg. broken shale 4,520 ft.
Shell Pet. Corp.'s No. 7 Heyd, 660 ft. out of NW cor. of lease, Sec. 13-9s-7w ..... Drlg. shale 1,775 ft.
Shell Pet. Corp.'s No. 3 E. O. Stafford, 330 ft. from N and E lines of W½ NW Sec. 18-9s-6w ..... Drlg. 6,129 ft., shale.

JENNINGS—ACADIA PARISH

Yount Lee Oil Co.'s No. 13 Houssiere-Latrielle, Sec. 47-9s-2w, 300 ft. E of No. 12 ..... Drlg. shale 7,354 ft.

LAKE BARRE—TERREBONNE PARISH

Texas Co.'s No. 10 L.L.&E., 4,543 ft. S, 503 ft. W of NW cor. Sec. 30-21s-20 ..... Drlg. shale 3,170 ft.
Texas Co.'s No. 20 State-Lake Barre, Sec. 30-21s-20e .... Drlg. salt 2,940 ft.
Texas Co.'s No. 27 State-Lake Barre, 4,050 ft. from W line and 2,608 ft. from N line of Sec. 30-21s-20e .... Abnd. location.

LEESVILLE—LAFOURCHE PARISH

Robt. Boles' No. 1 Crosby ..... Drlg. shale 3,238 ft.
Emerald Pet. Corp.'s No. 1 State Bayou LaFourche, 990 ft. N and 430 ft. E of SW cor. of Sec. 26-21s-22e .... Cmtd. 7-in. csg. 3,605 ft.; W.O.C.
Lincoln Oil Co.'s No. 2 State, 2,890 ft. N of S line of Sec. 26, in Bayou LaFourche, 15 ft. W of E bank, Sec. 26-21s-22e ..... Rigging up.
Texas Co.'s No. 11 L.L.&E., 2,921 ft. S, 1,560 ft. W of NE cor. Sec. 27-21s-22e ..... Drlg. shale 4,088 ft.
Texas Co.'s No. 13 L.L.&E. ..... Spudding.

LOCKPORT—CALCASIEU PARISH

Magnolia Pet. Co.'s No. 7 Farquaher, 330 ft. S, 174 ft. W of NE cor. SW NE Sec. 8-10s-9w ..... Drlg. clay 82 ft.
Magnolia Pet. Co.'s No. 11 Bordages, 660 ft. N, 490 ft. W of SE cor. NE NE Sec. 8-10s-9w ..... Coring 7,109 ft.
Magnolia Pet. Co.'s No. 19 Miller, Sec. 9-10s-9w ..... Old T.D. 3,237 ft.; top oil sand 4,191 ft.; T.D. 4,196 ft.; washing to bottom.
Union Sulphur Co.'s No. 1 Farquaher, 200 ft. S and W lines, NE cor. SW SE Sec. 36-12s-10w, 2-ac. tract .. T.D. 7,702 ft.; P.B. to 7,468 ft. and set screen; swabbing.
Union Sulphur Co.'s No. 2 Moss (W.O.), 350 ft. S, 210 ft. W of NE cor. NW SE ..... T.D. 6,675 ft.; set 7-in. csg. at 6,664 ft.; cleaning out.

PORT BARRE—ST. LANDRY PARISH

Gulf Ref. Co.'s No. 5 Wilson-Cockran, 600 ft. N, 910 ft. E of No. 2, Sec. 4-6s-5e ..... T.D. 3,773 ft., cap rock; P.B. 3,320 ft.; drilled to 3,418 ft.; preparing to pump.
Texas Co.'s No. 17 Botney Bay, 1,800 ft. S 8 deg. W, 600 ft. N 82 deg. most southern NE 560 deg. tract, Sec. 4-6s-5e ..... Derrick.
Texas Co.'s No. 20 Botney Bay ..... Drlg. lime 2,316 ft.

SORRENTO—ASCENSION PARISH

Union Sulphur Co.'s No. 2 Lacy White Frank, 1,175 ft. N, 1,615 ft. W of SE cor. Sec. 16-10s-4e ..... Salt 6,520 ft.; hole clean; S.D.
Union Sulphur Co.'s No. 25 United Land ..... T.D. 6,100 ft.; preparing to set short s.ring of 4½-in. csg.

STARKS—CALCASIEU PARISH

Gulf Ref. Co.'s No. 34 Lutcher-Moore, 1,313 ft. N, 400 ft. E of SW cor. Sec. 19-9s-12w ..... T.D. 3,610 ft.; set strainer.
Union Sulphur Co.'s No. 5 Industrial Lbr. Co., 300 ft. S of No. 4, Sec. 30-9s-12w ..... Spudding.

SULPHUR—CALCASIEU PARISH

Union Sulphur Co.'s No. 787 fee, 119 ft. N, 1,632 ft. W of C Sec. 29-9s-10w ..... T.D. 4,983 ft.; to deepen; waiting on cutting tool.
Union Sulphur Co.'s No. 788 fee, 602 ft. S, 1,209 ft. W of C Sec. 29-9s-10w ..... Drlg. shale 5,816 ft.
Union Sulphur Co.'s No. 790 fee, 929 ft. S and 802 ft. W of center of Sec. 29-9s-10w ..... T.D. 5,545 ft., hard sand; S.D. to core.
Union Sulphur Co.'s No. 791 fee, 529 ft. N, 907 ft. E of SW cor. Sec. 33-10s-12w ..... Drlg. water sand 6,662 ft.
Union Sulphur Co.'s No. 792 fee, 2,103 ft. N, 703 ft. E of C Sec. 9-9s-10w ..... T.D. 3,126 ft.; comp. 1,093 bbls. through ¾-in. choke.
Union Sulphur Co.'s No. 1 Noble, 1,745 ft. S, 150 ft. W of NE cor. Sec. 30-9s-10w ..... Drlg. hard sand 4,744 ft.
Union Sulphur Co.'s No. 1 Bernard Ulrich, 75 ft. out of SW cor. Sec. 19-9s-10w ..... Drlg. sandy shale 4,285 ft.

SWEET LAKE—CAMERON PARISH

Pure Oil Co.'s No. 12 Yount Lee fee, 800 ft. S of No. 11, in line with Nos. 9 and 10, Sec. 12-13-3w ..... Drlg. sticky shale 5,903 ft.

WHITE CASTLE—IBERVILLE PARISH

Shell Pet. Corp.'s No. 8 Wilbert, 717 ft. N 60 deg. 30 min. E from SE of Lot 2 of Fractional Sec. 9, in Sec. 1-11s-12e ..... Drlg. 4,466 ft.

VINTON—CALCASIEU PARISH

Gulf Ref. Co.'s No. 72-Gardner-Noble-Gray, 643 ft. E, 50 ft. S of NW cor. NE SE Sec. 33-10s-12w ..... Drlg. sticky shale 4,078 ft.
McLean's No. 16 Gray ..... Reaming 1,968 ft.
Tri-Oil Co.'s No. 1 Matilda Gray, 58 ft. W, 35 ft. N, of SE cor. NE SW NE Sec. 33-9s-12w ..... Drlg. gumbo 1,122 ft.
Wilson Broach Co.'s No. 13 Wilson strip, 50 ft. N and 907 ft. E of SW cor. of Sec. 33-10s-12w ..... T.D. 3,510 ft.; no report.
Union Sulphur Co.'s No. 1 Vincent ..... Drlg. 6,424 ft.
Wilson Broach's No. 14 Wilson Strip, 50 ft. N, 643 ft. E of SW cor. SE NE Sec. 33-10s-12w ..... Cmtd. csg. 3,324 ft.
Vinton Pet. Co.'s No. 3 Gordon, Sec. 34-10s-12w, 209 ft. from S line, 50 ft. from W line of 2-ac. tract .. Drlg. shale 3,288 ft.

MISCELLANEOUS WILDCATS

TEXAS

AUSTIN COUNTY

Humble O. & R. Co.'s No. 1 Chelsey, 418 ft. from NW and 150 ft. from S line of 26-ac. tract in W. C. White Sur. ..... Rigging up.
Merrie Bros., Perrini, Turnbull & Irwin's No. 1 Headge.. Rigging up.
R. R. Mitchell's No. 1 H. Schleider, J. F. Fitzgibbons Sur., 300 ft. out NE cor. 96-ac. tract ..... T.D. 105 ft.; S.D.
Tibbets et al's No. 1 Heidman, 4,320 ft. W along N line from NE cor. of A. Larison Sur. in J. Cooper Sur., 410 ft. at right angles north ..... Drlg. shale 2,550 ft.

BRAZORIA COUNTY

Danciger O. & R. Co.'s No. 3-A Hunt, 2,100 ft. from E, 2,000 ft. from S lines of Hunt's 1,000-ac. tract in W. C. Carson Sur. ..... Drlg. new hole 1,975 ft.
Danciger Oil & Ref. Co.'s No. 1-B Hunt, 1,400 ft. from NW line and 1,750 ft. from NE line of 1,600-acre tract in W. C. Carson Sur. ..... Derrick.
Danciger Oil & Ref. Co.'s No. 1 Stark-Brown, 330 ft. out of most easterly NE cor. of lease in Perry & Austin Sur. ..... Derrick.
Harrison & Abercrombie's No. 1 M. D. Howe, 993 ft. W line, 330 ft. N line, Blk. 18, Thomas Spraggins Sur. ..... Shale 6,215 ft.; S.D.
Shell Pet. Corp.'s No. 2 Haury (Danbury), H.T.&B. R.R. Sur., 720 ft. SE of No. 1 Blakely-Winston ..... T.D. 6,067 ft., salt; P.B. to 3,950 ft.; W.O.C.
West Len Oil Co.'s No. 1 Settegast, W. C. D. Hall Sur., 4,700 ft. from SW line, 1,041 ft. from NW line of survey ..... T.D. 6,266 ft.; abnd.

BRAZOS COUNTY

H. Elliott et al's No. 1 W. F. Odom, near center of 379-ac. tract in SW cor. of Isack Curil Sur. ..... Cmtd. surface csg. 30 ft.
Liner et al's No. 1 Peters, 300 ft. SE line, 300 ft. SW line of E. V. Peter fee, G. Powell Sur. ..... Derrick.
F. H. Scott's No. 1 Klintworth, L. Curd Sur., 300 ft. from N line, 400 ft. from E line ..... Gas sand 1,393-1,420 ft.; S.D., orders; T.D. 1,512 ft.

BURLESON COUNTY

Mid-Tex Oil Co.'s No. 2 Young, 700 ft. S of No. 1 in J. Bird Sur. ..... Drlg. 970 ft., shale.

CHAMBERS COUNTY

John H. Carrecker's No. 1 B. Weaver, 404 ft. out of SE cor. of lease in A. Weaver Sur. ..... T.D. 390 ft.; standing.

J. E. Jones' No. 1 Canada-Smith Ranch, 356 ft. W and 330 ft. N of NE cor. of W. F. Gau 544-acre tract in J. S. Roberts Sur. ..... Set 10¾-in. csg. at 1,370 ft.; drlg. shale 2,420 ft.

Miramar Oil Co.'s No. 1 Geo. Stengler, V. Barrow Sur., 3,200 ft. from E line and center of N and S lines of lease ..... Derrick.

FORT BEND COUNTY

O'Connor Dome Oil Co.'s (was A. N. Phillips et al's) No. 1 Grigar, 2,150 varas E line, 1,550 varas N line, J. S. O'Connor Sur. ..... Drlg. 5,020 ft.

Phillips Pet. Co.'s No. 1 A. B. Holmes, 600 ft. from E and 300 ft. from S lines of 200-ac. tract in Samuel Isaac Sur. ..... Drlg. hard shale 3,850 ft.

Porter & Blanchard's No. 2 Wheat ..... Odor oil 3,528-83 ft.; T.S. 2.928 ft.; W.O.C.

Quintana et al's No. 2 Wood, O'Connell & Mellon, 304 ft. from S line and 5,360 ft. from E line of lease ..... T.D. 6,305 ft.; tested S.W.; S.D. for orders.

GRIMES COUNTY

Clark & Dodd's No. 1 Murry, 150 ft. W line, 300 ft. S line, Anderson Sur. ..... T.D. 708 ft.; S.D.

Cambrian Oil Co.'s No. 1 W. V. Sangster, John Moore Sur., 300 ft. out of most westerly NW cor. of 218-ac. tract ..... Derrick.

Foster et al's No. 1 Quinn, 7,100 ft. from W line, 3,900 ft. from N line of S. F. Austin Sur. ..... T.D. 3,825 ft.; P.B. 3,200 ft.

H. C. Ratcliff's No. 1 Fulgham, A. Tuttle Sur., 600 ft. N line, 540 ft. W line of lease ..... Derrick.

HARDIN COUNTY

Resource Oil Corp.'s No. 1 Sternberg Oil Co., C. of G. Dorsey No. 3 Sur., Abst. 193 ..... Derrick.

HARRIS COUNTY

Golding & Murchison's No. 1 Clappert, W.C.R.R. Sur., Blk. 4, Sec. 9, 1,350 ft. from E line, 330 ft. from N line ..... T.D. 3,250 ft.; show gas and odor oil 3,198-3,220 ft.; drlg. shale 5,615 ft.; top Hockley 5,375 ft.

J. A. Hodges' No. 1 Scott, 200 ft. S. 900 ft. W of intersection of Crosby Huffman, F. Rankin Sur. ..... T.D. 6,275 ft.; S.D.

G. L. McCarthy et al's No. 1 Preston, Wm. Jones Sur., 236 ft. E. 161 ft. S of NW cor., Blk. 9, W. A. Payne Subd. ..... Drlg. shale 4,725 ft.

HOUSTON COUNTY

Murmac Oil Co.'s No. 1 G. L. Murray & Son, John Durst Sur. ..... T.D. 3,450 ft.; S.D.

JACKSON COUNTY

Atkins & O'Neil's No. 1 Ward (Davis), C Lot 93, I.&G.N. Sur. No. 18, Blk. 8 ..... Drlg. 3,050 ft.

Encio Gas Co.'s No. 1 Toney, 150 ft. out of NW cor. of Toney's 1,064-ac. tract in Raymor Musquiz Sur. .. Drlg. 1,500 ft.

JASPER COUNTY

Louis Franklin's No. 1 Cartwright, 360 varas E line and 740 varas S line of Lot 19, Edward Legrande Sur. .... Derrick.

JEFFERSON COUNTY

Lucky Strike Oil Co.'s No. 1 Walker, D. Easley Sur., 2,100 ft. N, 1,400 ft. E of NW cor. of Lot No. 13 .... S.D. 1,708 ft., shale and lime.

Sun Oil Co.'s No. 1 H. Long, 1,500 ft. N line, 990 ft. E line of lease ..... T.D. 5,916 ft.; reaming 5,699 ft.

LIBERTY COUNTY

Denton & Akin's No. 1 B. E. Quinn, A. B. Rozelle Sur., 3,075 ft. from E line and 4,750 ft. from S line of Sur. ..... T.D. 5,576 ft.; made 6-min. D.S. test 5,477-5,561 ft.; 3 thribbles mud, no pressure, ¼-in. choke on top and bottom; to make another test.

Gulf Prod. Co.'s No. 2 Kirby, John Pleasants Sur., 1,866 ft. S of No. 1 ..... Coring 7,218 ft.; odor oil 7,198 ft. and 7,175 ft.

Gulf Prod. Co.'s No. 1 Grogan, Clayton Harper Sur., 1,500 ft. from E line and 466 ft. from S line ..... T.D. 5,910 ft., black shale; abnd.

Miramar Oil Corp.'s No. 1 Crowe & Jacobs, H.&T.C. Sur. 21, 950 ft. W of E line, 110 ft. N of S line of 300-ac. tract ..... T.D. 4,563 ft.; swabg. 200 bbls. of P.L. oil daily through 5/16-in. choke; grav. 26, corrected.

H. Sample's No. 1 Security Trust Co., 466 ft. from S and E lines of N 600 ac. of Lot 3 of H. Sample Subd. of J. Faulk Sur. ..... Location; clearing titles.

Turnbull & Irwin et al's No. 1 N. Hildebrandt, W. Whitlock Sur., C of E ⅛ of survey ..... Rigging up.

Wilcox Oil & Gas Co.'s No. 1 Cousins, Jas. Knight Sur., 1,320 ft. from N line and 875 ft. from E line of lease ..... T.D. 6,030 ft.; abnd.

MADISON COUNTY

Paul Edwards et al's No. 1 L. M. Peters, Mahala Wilkinson Sur., 400 ft. from N line and 300 ft. from W line of 132-acre tract ..... Rigging up.

Foster et al's No. 1 Poteet, J. E. Hunter Sur., 350 ft. S and 150 ft. E of most westerly NW cor. of 288-acre tract ..... S.D. 2,280 ft.

MATAGORDA COUNTY

Oils Consolidated's No. 2 Hawkins, 200 ft. due NE of No. 1 well ..... Cmtd. 9⅝-in. csg. at 5,358 ft.; W.O.C.

Skelly Oil Co.'s No. 1 Cobb, M. Cummins Sur., 434 ft. from E. 1,506 ft. S of F. G. Cobb's 167-ac. tract .... T.D. 7,186 ft.; P.B. to 7,076 ft.; on D.S. test made considerable distillate; equalized pressure 2,550 lbs.; testing sand 7,026-45 ft.

United North & South Dev. Co.'s No. 1 Unit 4, Buckeye farm, J. C. Keller league, 314 ft. N line and 202 ft. E line of lease ..... Drlg. gumbo 1,725 ft.

United North & South Dev. Co.'s No. 1 Unit 8 (No. 2 Stoddard), 25 ft. each way out of NW cor. of Lot 19, Buckeye townsite ..... T.D. 9,257 ft.; sidetracked at 6,750 ft.; coring 8,190 ft.

MONTGOMERY COUNTY

Baker et al's No. 1 Benker, D. James Sur. ..... Old T.D. 4,921 ft.; P.D. to 4,409 ft.; T.D. 4,647 ft.; D.S. test 4,629-47 ft., 3 min., ⅛-in. choke on top and bottom; small amount gas; no pressure; lost seat.

Cooper & Smith's No. 1 Post, Daniel Roper Sur. ..... Drlg. sandy shale 1,910 ft.

Deering & Frazier's No. 1 Hicks, 660 ft. S and W of NE cor. 565-acre tract, T. Taylor Sur. ..... Bldg. road.

Hamill & Smith's No. 1 Foster Lbr. Co., Pryor Bryan Sur., 7,147 ft. from W line and 3,760 ft. from N line of lease ..... Shale 6,270 ft.; no report.

Steen Drlg. Co.'s No. 1 Long Bell Lbr. Co., 440 ft. S and E from NW cor. of Wilson Barker Sur. ..... Top Cockfield 5,815 ft.; sand 5,867-69 ft., sand 5,873-77 ft.; D.S. test 5,855-77 ft. showed 350 lbs. pressure with 2 gals. dist. and 2 gals. mud in 4 min.; coring 5,981 ft.; D.S. test 5,873-84 ft., 575 lbs. pressure, 15 min., 1 joint brown dist., ¼-in. choke on top, ⅜-in. choke on bottom.

NEWTON COUNTY

Tide Water Oil Co.'s No. 1 Southwest Lbr. Co., 467 ft. S of most southerly N line and 1,664 ft. E of most westerly W line of 1,500-ac. tract in Henry Cochran Sur. ..... Bldg. derrick.

NACOGDOCHES COUNTY

James W. Rich's No. 1 Unknown, J. L. Ewing Sur., 2,777 ft. from W line, 5,208 ft. from S line of survey .. No report.

ORANGE COUNTY

Blue Line Oil Co.'s No. 1 Godwin, Richard Ballew Sur., 300 ft. from E line and 150 ft. from NE line of Godwin 20-acre tract ..... S.D. 900 ft.; bldg. road.

Texas Louisiana Oil Co.'s No. 1 Starks, 2,450 ft. N of NW cor. M. Delano Sur. 68, 10,500 ft. E at R/A .... T.D. 1,200 ft.; S.D.

POLK COUNTY

Alpha Pet. Co.'s No. 1 Kirby & West, Thomas Sur., 330 ft. out of SE cor. of 150-ac. lease ..... Coring 4,515 ft.

REFUGIO COUNTY

Cox et al's No. 1 F. W. Bissett, J. Crockett Sur. ..... Drlg. 1,000 ft.

Heard-Holland Oil Co.'s No. 1 Peck, 366 ft. N and W out of NW and SW of Bonnie View Subd. ..... Top Heterostegina 4,437 ft.; S.D. 4,500 ft.

G. Jeffries' No. 1 James F. Power, 759 ft. from N and 1,312 ft. from E lines of 500-acre lease in J. J. Garza and J. Vidaurri Sur. ..... S. D. 550 ft.

Humble O. & R. Co.'s No. 11 O'Connor, Powers & Hewitson Sur., 301 ft. S. 323 ft. E of No. 10 ..... T.D. 3,196 ft.; P.B. to 3,170 ft.; testing; comp. 80 bbls. per day.

Humble Oil & Ref. Co.'s No. 12 O'Connor, 920 ft. W of No. 11, J. Keating Sur. ..... T.D. 3,082 ft.; preparing to make D.S. test.

SAN AUGUSTINE COUNTY

Fidelity Exploration Co.'s No. 1 Bryan & Flourney, 1,926 ft. from N and 725 ft. from E lines of Sec. 14, S.P.R.R. Sur. ..... Moving in rig.

SAN JACINTO COUNTY

Darby Jones' No. 1 McBee ..... Drlg. shale 2,680 ft.

Piedmont Oil Co.'s No. 2 Foster, 330 ft. each way out of NE cor. Geo. Taylor Sur. ..... Building road.

Turnbull & Irwin's No. 1 Fitzgerald, Gowan Harris Sur., 3,300 ft. from E line and 1,320 ft. from N line of tract ..... Drlg. 2,650 ft.

VICTORIA COUNTY

Markle et al's No. 1 Dunlap, Manuel Zepeda Sur., 9,550 ft. along NW line of survey from most northerly NE cor. and 1,475 ft. SE at R/A ..... S.D. 1,818 ft.

Wm. Quick's No. 1 Tom Joshua, 330 ft. out of NW cor. of Blk. 21, F. G. Hidalgo Sur. ..... Rigging up.

Texas Co.'s No. 6-A McFaddin, A. J. Gray Sur., 5,600 ft. from NE line, 250 ft. from SE line ..... Drlg. shale and lime 4,204 ft.

Texas Co.'s No. 7-A McFaddin, 250 ft. due N of No. 7, A. J. Gray Sur. ..... T.D. 1,597 ft.; standing with 125 lbs. pressure.

Texas Co.'s No. 8 McFaddin, A. J. Gray Sur., 6,600 ft. N of S line, 1,383 ft. from E line of NE cor. ..... D.S. stuck 3,609 ft.; cut pipe to 2,798 ft.; P.B. to 1,825 ft.; sidetracked to 3,609 ft.; set 8⅝-in. csg. to 3,426 ft.; drlg. 3,862 ft., shale and lime.

WHARTON COUNTY

Nabers et al's No. 1 Lurker, 210 ft. out of SE cor. of N½ SW Sec. 58, E.T.R.R. Sur. ..... T.D. 5,026 ft.; P.B. 3,865 ft.; abnd.

Pure Oil Co.'s No. 1 Stewart ..... T.D. 5,983 ft.; preparing to pull 5½-in. O.D. csg. cmtd. 5,311 ft.

Pure Oil Co.'s No. 2 Stewart, Morris & Cummings Sur., Sec. 25, 990 ft. out of SW cor. of 160 acres ..... Drlg. sandy shale 5,212 ft.

Pure Oil Co.'s No. 1 A. J. Wilder, T. W. Hurd Sur. 509, 2,375 ft. SE, 1,690 ft. NE from W cor. Sec. 28 .. T.D. 7,614 ft.; D.S. stuck 6,800 ft.; T.D. 4,000 ft.; temp. abnd.

Pure Oil Co.'s No. 1 Wallace Houston, 858 ft. SE of NW line, 1,690 ft. NE of SW line, Sec. 28 (T. W. Heard Sur.) ..... T.D. 6,457 ft.; shot 5-in. csg. at 5,554 ft.; drlg. 5,912 ft., sticky shale.

Pure Oil Co.'s No. 1 Isaac Weaver, J. M. Brownson Sur., Sec. 22, 1,650 ft. out of N cor. of section .... T.D. 6,455 ft.; comp. 112 bbls. of 62.4 gravity oil through ⅝-in. choke.

SOUTH LOUISIANA

ACADIA PARISH

Mills Bennett Prod. Co.'s No. 1 Riverside, 1,400 ft. S. 467 ft. E of NW cor. Sec. 61-9s-2w ..... T.D. 7,590 ft.; hole cleaned to 3,020 ft.; abnd.

Rhodes Drlg. Co.'s No. 1 Latrell ..... Drlg. gumbo 1,870 ft.

Superior Oil Co.'s No. 1 P. O. Hermandes, 990 ft. W. 990 ft. S of NE cor. SE Sec. 34-8s-3e ..... Drlg. 8,405 ft.

Woodley Pet. Co.'s No. 1 Links Bros., 150 ft. S and E of NW cor. Sec. 36-7S-1e ..... Drlg. 1,110 ft.

ASCENSION PARISH

Turnbull & Irwin's No. 1 Community (Darrow) ..... T.D. 5,623 ft.; T.S. 5,609 ft.; swbg. and flowing by heads.

BEAUREGARD PARISH

Humble Oil & Ref. Co.'s No. 1 Long Bell, 200 ft. E of W line and 2,640 ft. S of N line of Sec. 11-5s-7w .. Drlg. shale 6,511 ft.

CALCASIEU PARISH

Fred Oil Co.'s No. 1 Faizat, 566 ft. N, 300 ft. W of SE cor. of NW of SE Sec. 26-3s-10w ..... Drlg. lime 2,015 ft.

Union Sulphur Co.'s No. 1 Barbe, 2,681 ft. W, 2,647 ft. S of NE cor. Sec. 1-9s-8w ..... Drlg. sandy shale 8,072 ft.

IBERIA PARISH

Y. D. Spell's No. 1 Bernard, 5,138 ft. SW cor. along western boundary line, then in NE direction 1,140 ft. along N line of Bernard land, 52 ft. S of well in Sec. 54-12s-7e ..... S.D. 2,850 ft.

JEFFERSON DAVIS PARISH

Humble O. & R. Co.'s No. 2 Devilbiss, 1,850 ft. S. 250 ft. W of NE cor. Sec. 14-9s-4w ..... T.D. 8,423 ft.; tested S.W. 8,175-90 ft.; P.B. to 7,781 ft.; preparing to start swabbing.

Shell Pet. Corp.'s No. 1 Kratza, 660 ft. S, 330 ft. W of NE cor. NW Sec. 12-9s-4w ..... T.D. 7,527 ft.; reaming 6,797 ft. to set csg.

Geo. W. Strake's No. 1 Pedigrew, 200 ft. out of SW cor. Sec. 9-9s-6w ..... T.D. 7,348 ft.; abnd.

LAFOURCHE PARISH

Barnsdall Oil Co.'s No. 1 Harans, Lot 8, Twp. 17s-20e .. T.D. 7,195 ft. in salt; P.B. to 6,306 ft.; drlg. to 6,954 ft.; P.B. to 2,214 ft.; abnd.

Southern Sulphur Corp.'s No. 1 D. L. Lagraize, 800 ft. E of NW cor. of Lot 7, thence 250 ft. S of Sec. 26-21s-22e ..... Spudded and S.D.

ST. BERNARD PARISH

Southern Sulphur Corp.'s No. 1 Lake Lery, 400 ft. W. 500 ft. N, SW cor. Sec. 28-13s-15e ..... Gumbo 2,867 ft.; no report.

ST. LANDRY PARISH

H. H. Hotchins Lbr. Co.'s No. 1 Whiteman Lbr. Co., 250 ft. out of SW cor. NE Sec. 15-5s-6e ..... S.D. rock 3,557 ft.

ST. MARTIN PARISH

Standard Oil Co. of Kansas' No. 1 E. B. Hopkins, Sec. 33-10s-6e ..... Shale 7,503 ft.; P.B. to 6,600 ft.; trying to sidetrack.

TERREBONNE PARISH

Texas Co.'s No. 1-B State-Bay Junop, 2,200 ft. N, 950 ft. E of SW cor. Sec. 27-21s-14e ..... Drlg. shale 4,210 ft.

Texas Co.'s No. 10 State-Caillou Island ..... T.D. 5,653 ft., sand rock; D.S. stuck; drlg. new hole; sand 4,553 ft.

Texas Co.'s No. 11 State-Caillou Island, 500 ft. SW from No. 9, Sec. 9-22s-20e ..... Drlg. shale 3,454 ft.

Texas Co.'s No. 2 State-Four Island Bayou ..... T.D. 6,740 ft.; abnd.

Texas Co.'s No. 7 State Bay-St. Elaine, 3,900 ft. N, 2,300 ft. E of SW cor. Sec. 3-22s-18e ..... Drlg. salt 2,964 ft.

VERNON PARISH

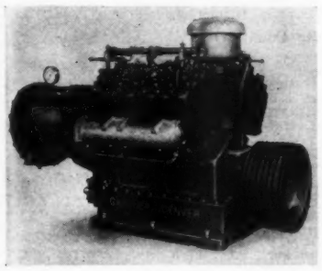
Robt. K. Williams, Jr.'s No. 1 Llano Del Rio, 1,185 ft. S. 1,000 ft. W of NE cor. Sec. 7-1n-9w ..... Rig.

NEW AND IMPROVED EQUIPMENT

Gardner-Denver Develops New Line of Compressors

Designed especially to achieve greater savings in air-compressor costs, a new line of vertical compressors has been announced by the Gardner-Denver Co., Quincy, Ill., manufacturer of high-speed vertical water-cooled compressors. According to officials of the company, the new verticals surpass even the cost saving records of previous Gardner-Denver models. Installation cost is given as two-thirds lower, and maintenance costs from 25 to 50 per cent less. In addition, the new verticals make possible a valuable saving in floor space.

Inlet and discharge valves are cushioned, and are silent, durable and efficient. Extra-large water jackets com-



pletely surround the cylinders and valves, assuring minimum cylinder temperatures. A water-cooled intercooler saves power and increases volumetric efficiency by cooling air between stages.

The crankshafts are large-diameter forged steel, supported by three main bearings of the bronze-babbitt-lined full circle type. There is pressure-feed lubrication to all bearings through drilled passages, thus eliminating oil pipes which are subject to breakage and leakage. A rotary oil pump assures constant and uniform oil pressure.

Making Special Alloys of Interest to Oil Industry

The Weld-o Alloys Co., 1702 East Sixth Street, Tulsa, recently formed, is making several special alloys of interest to all branches of the oil industry in which machinery is used. One of its products is a tungsten contained hard surface suitable for heavy abrasive work. This rod is designed as Weld-o (Red). Another is a general purpose hard surface that gives satisfactory wear on jobs where it is not necessary to use a tungsten contained metal. This is called Weld-o (Blue). Both of these metals are extremely hard, yet have remarkable toughness. They forge readily after application and are not affected by quenching where it is desirable to harden or temper the part upon which the metal has been placed, nor do they crack or "shell off."

Another product is a metal and process for welding cylinder blocks, cylinder heads, etc., without preheating. The company's products are manufactured and distributed by the Progressive Brass Manufacturing Co.

Wilbur G. Hudson has been appointed chief engineer of Link-Belt Co.'s Pershing Road plant in Chicago. Mr. Hudson, after graduating from Cornell, entered the employ of Link-Belt in Philadelphia, Pa., as a draftsman.

Among the Equipment Houses

The Byron Jackson Co., Los Angeles, Calif., manufacturer of oil field equipment, will open a branch sales office in Tulsa, Frank Champion, general sales manager, has announced. D. O. Pugh, formerly manager of the company's store in Fort Worth, Tex., will be in charge of the Tulsa office.

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Ralph G. Caulley has joined the Detroit district sales office of the Republic Steel Corp., according to announcement by N. J. Clarke, vice president in charge of sales. Mr. Caulley had been connected with the Wheeling Steel Corp. 14 years, the last seven in the Detroit district.

—

The Babcock & Wilcox Tube Co. announce that the territory served by its Tulsa sales office, managed by C. J. Hochenauer, has been enlarged to include Oklahoma and the southern half of Kansas.

—

The Manhattan Rubber Co., Passaic, N. J., has appointed Charles H. Bauer merchandising manager of its V-belt department.

Baker Oil Tools Introducing New Casing Bridge Plug

To meet demands in connection with special cementing jobs, Baker Oil Tools, Inc., is introducing its Model C casing bridge plug, with circulation jar.

This new tool is an inverted, pull-up, cast-iron packer, similar to the Baker Model C cement retainer, and is run into the casing on a string of tubing or drill pipe, and set at any predetermined point. Experienced operators will appreciate the advantages of a plug which can be set precisely where desired, with the assurance that it will remain set at that point, regardless of pressure from either direction.

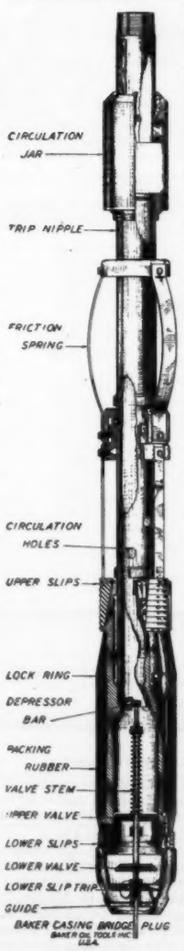


Fig. 1

Reference to the accompanying illustrations will show details of construction and operation. After the bridge plug is set and the trip nipple unscrewed, the valve stem (to which the lower valve is fastened) is released, closing the lower valve and at the same time releasing the lower slips to contact the casing, as shown in Figure 2. A ratchet lock ring in the cone locks the cone to the inner body after the setting strain is released, maintaining the expansion of the rubber packing securely against the interior of the casing. The bridge plug is thus securely locked in the casing, tightly packed by the expanded rubber, with slips set at top and bottom to prevent movement of the string either up or down.

The Baker bridge plug is equipped with the Baker circulation jar, the same as the Baker Model C cement retainer. The tubing trip nipple (around which the trip mechanism is built and to which the jar is attached) contains circulation holes, which function should an emergency arise that requires circulation, and it is connected to the body of the plug by means of a special left-hand square thread to facilitate unscrewing to disconnect.

Although a great variety of uses will suggest themselves to the experienced operator, the Baker bridge plug is of outstanding importance in cementing through perforations in casing set in the well. The plug is set in the casing below the perforations and a small amount of cement dumped on top of it. A Baker cement retainer, Model C is then run and set at a point just above the perforations, and cement is pumped through the perforations as desired.

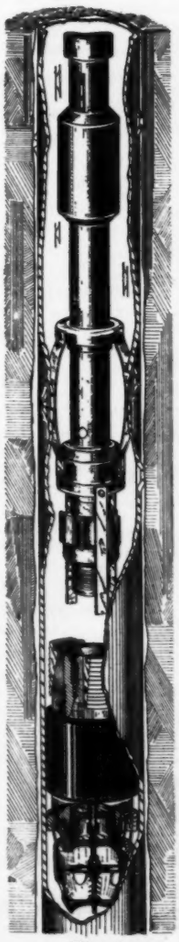
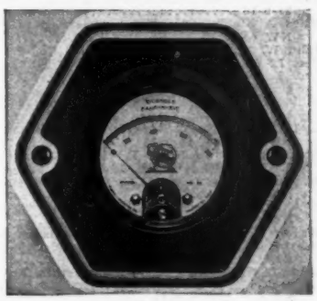


Fig. 2

The Baker casing bridge plug runs in all weights of A.P.I., or nominal, casing from 4½-inch to 9⅝-inch, inclusive; and connects to 2-inch, 2½-inch and 3-inch tubing. Detailed literature may be obtained from Baker Oil Tools, Inc., Box 1185, Houston, Tex.; Box 4333, Oklahoma City, Okla.; Box 600, Huntington Park, Calif.; and for export, Room 1914, 19 Rector Street, New York.

Holdheet Pyrometer Unites Accuracy With Ruggedness

Holdheet pyrometers, manufactured by the Russell Electric Co., 380 West Huron Street, Chicago, were developed with the idea of combining maximum accuracy



with a rugged and durable construction. They are of the direct reading type and have manual cold end correction adjustment.

The manufacturers point out that an accurate pyrometer is inexpensive insurance of the quality and uniformity of products made. The workman's constant knowledge of operating temperatures does much to prevent mishandling, overheating, incorrect temperatures, guesswork and faulty operation.

The Holdheet eliminates connection leads and employs heavy gauge thermocouples. This results in a total variable external resistance which is so low that its resistance is less than one part in 150 parts of the meter resistance. With the resulting large current flow, the Holdheet pyrometer is able to employ a substantial, rugged movement that does not easily get out of order, together with substantial control springs that are said to make the meter practically dead-beat.

The different thermocouples used with the Holdheet portable pyrometer have almost the same electrical resistance. Because of this fact, it is possible to calibrate the meter with an external resistance equal to the average resistance of the different thermocouples. This reduces the maximum possible error due to external resistance to even less than one part in 150.

Applications of the Holdheet include oil refineries, gum and asphalt kettles, coil impregnating tanks, heat treating machines, etc.

YOUNGSTOWN EXPANDING MILL

The Youngstown Sheet & Tube Co., plans to expand its electric weld mill at its Briar Hill plant in Youngstown, Ohio, to include production of smaller sizes of electric-welded pipe, it is announced by Frank Purnell, president. The mill now manufactures electric weld pipe in sizes from 18 to 26 inches. The new extension will permit manufacture of pipe from 16 inches down to 8 inches, and intermediate sizes. This will give the company a range in size of electric-weld pipe from 8 inches to 26 inches. The cost of the extension will be approximately $500,000.

WELDING HANDBOOK ENLARGED

A revised and enlarged edition of "Procedure Handbook of Arc Welding Design and Practice" is announced by the Lincoln Electric Co., Cleveland, Ohio. The original issue, published last fall, was exhausted. Orders for the books have been received from some 25 foreign countries as well as every state in the Union at the rate of more than 1,000 a month. The price of the volume is $1.50.

Wildcat Operations in Louisiana-Arkansas

(Continued from Page 134)

J. W. Bettis et al's No. 1 Frost Lbr. Ind., 330 ft. S and W, NE cor. SW Sec. 15-9-13 ..... Rigging up.
R. B. Campbell et al's No. 1 Cook Land Co., 150 ft. N, 300 ft. W, SE cor. NW NW Sec. 35-10-13 ..... Drlg. 800 ft.
Cleary Brothers' No. 2 Harris, 100 ft. N and E, SW cor. Lot 21, Sec. 10-9-13 ..... W.O.S.R. 1,997 ft.
A. G. Craig's No. 1 Belton, 330 ft. N and E, SW cor. NW NW Sec. 33-9-13 ..... S.D. 1,150 ft.
Florence Oil Co.'s No. 2 Crawford, Sec. 20-9-13 ..... Set 7-in. 1,486 ft.; T.D. 1,986 ft.
Alfred Glassell's No. 1 Tatum, 330 ft. N and W, SE cor. NE NW Sec. 9-9-13 ..... S.W. and abd. 2,021 ft.
Helena O. & G. Co.'s No. 1 Burkett, 330 ft. S and W, NE cor. SE NE Sec. 16-9-13 ..... W.O.S.R. 1,999 ft.
Earl Halliburton's No. 1 Barr, 990 ft. S, 330 ft. E, NE cor. SW SE Sec. 15-9-13 ..... Used acid 1,960 ft.
Earl Halliburton's No. 1 Burkett, 330 ft. S and W, NE cor. SW SE Sec. 9-9-13 ..... Comp. flowing 1,000 bbls., 2,030 ft.
L. D. Higgins et al's No. 1 Burkett, 330 ft. S, 370 ft. W, NE cor. Sec. 16-9-13 ..... Tested dry; W.O. 2,015 ft.
R. P. Holland et al's No. 1 A. J. Burkett, 990 ft. N, 330 ft. W of C, Sec. 10-9-13 ..... Comp. flowing 200 bbls., 1,935 ft.
Lula M. Layton's No. 2 Henderson, 330 ft. S and W, NE cor. NW NW Sec. 29-9-13 ..... Drlg. 1,100 ft.
Zan Lloyd's No. 1 Henderson, 330 ft. N and W, C Sec. 29-9-13 ..... Using acid 2,000 ft.
Miles & Strickland's No. 1 McGee, 17 ft. S, 26 ft. E, NW cor. Lot 18, Sec. 9-9-13 ..... S.D. for fuel 950 ft.
John W. Moffett's No. 1 Logan Oil Co., Sec. 3-9-13 ..... W.O.S.R. 1,985 ft.
Geo. L. Pace's No. 1 Heard, Sec. 10-9-13 ..... Testing 2,044 ft.
Geo. L. Pace's No. 1 Logan, 430 ft. N, 330 ft. E, SW cor. Sec. 26-10-13 ..... Set 10-in. 45 ft.; drlg. 850 ft.
Sabine Royalties Co.'s No. 3 Graham, 330 ft. S and W, NE cor. SW NW Sec. 20-9-13 ..... Set 10-in. 40 ft.; drlg. 1,000 ft.
L. L. Posey's No. 3 Burkett, 330 ft. S and E, NW cor. NE NW Sec. 10-9-13 ..... Used acid 1,965 ft.
Reese & Martin's No. 1 E. Harris, 360 ft. S, 190 ft. E, NW cor. SE NW Sec. 10-9-13 ..... Comp. pumping 250 bbls., 1,939 ft.
W. E. Rowe et al's No. 1 Craig, 330 ft. S and E of center Sec. 22-9-13 ..... Set 10-in. 40 ft.
J. A. Stinson's No. 1 Whitney Corp., 330 ft. S and W, NE cor. Sec. 8-9-13 ..... Drlg. 1,320 ft.
Walter R. Smith's No. 1 Rheta Williams, Sec. 9-9-13 ..... W.O.S.R. 1,975 ft.
Martin L. Stephens' No. 1 Burkett, 330 ft. S and W, NE cor. NE NW Sec. 10-9-13 ..... Drlg. 1,835 ft.
Stumpff & McFall's No. 1 Paul estate, Sec. 10-9-13 ..... Set 8-in. 1,734 ft.
Texas Trading Co.'s No. 1 Isgitt, 78 ft. N, 41 ft. W, SE cor. Sec. 9-9-13 ..... Comp. pumping 15 bbls., 2,030 ft.
Windsor Oil Co.'s No. 2 Barr, 330 ft. N and E, SW cor. NW Sec. 15-9-13 ..... Location.

RAPIDES PARISH

Ben Banner's No. 1 Bentley Lbr. Co., 2,640 ft. E, NW cor. Sec. 11-4n-5w ..... Rigging up.
Ben Banner's No. 1 Bentley Lbr. Co., 330 ft. S and W, NE cor. NW Sec. 11-6-6 ..... Drlg. 50 ft.
Evans & Collingsworth's No. 1 Hickman, 330 ft. S and E, NW cor. Sec. 40-4-1e ..... Drlg. 2,320 ft.
J. C. Prine et al's No. 1 Baum, 600 ft. N and E, SW cor. NE SW Sec. 27-6n-2e ..... Drlg. 2,111 ft.

UNION PARISH

Ward & Jones' No. 1 Miller, 330 ft. S and E, NW cor. SW SW Sec. 16-21-2e ..... S.D. 1,210 ft.

WEBSTER PARISH

I. G. Abney Oil Co.'s No. 1-B R. L. Slack, 330 ft. E, 660 ft. N, SW cor. SE Sec. 36-23-11 ..... Set 10-in. 294 ft.; drlg. 610 ft.
Dorcheat Synd.'s No. 1 Hodges, 330 ft. S and W, NE cor. SE SW Sec. 25-22-10 ..... Drlg. 2,655 ft.

Arkansas

ASHLEY COUNTY

K. R. March's No. 1 Williams, 660 ft. S and E, from C of Sec. 8-18-4w ..... Coring 3,005 ft.

HEMPSTEAD COUNTY

A. H. Bagnelle's No. 1 Trattner & Rhinehart, Sec. 2-13-26 ..... S.D. 1,186 ft.

JEFFERSON COUNTY

L. L. Schumacher's No. 1 Danaha, 330 ft. N and W, SE cor. Sec. 16-5s-9w ..... Dry and abd. 3,825 ft.

LAFAYETTE COUNTY

Douglas Lawn's No. 1 Camp, 330 ft. S and W, NE cor. SW SE Sec. 14-15-23 ..... Set 10-in. 52 ft.
George W. Harper's No. 2 Bodcaw, 150 ft. S, 550 ft. E NW cor. SW NW Sec. 14-15-23 ..... S.D. 1,216 ft.

MILLER COUNTY

Duluth-Ark. Oil Co.'s No. 2 Beck, 330 ft. S and E, NW cor. SE SW Sec. 34-15-26 ..... Arranging to pump with jack 2,807 ft.
Fitzwater et al's No. 1 Norson, SW cor. SE SW Sec. 20-15-27 ..... S.D. 3,177 ft.
King Oil Corp.'s No. 1 C. H. Schroder, 300 ft. N, 330 ft. E, SW cor. SW NE Sec. 34-14-25 ..... S.D. 1,218 ft.
C. E. Murdock's No. 1 Rose, Sec. 4-16-26 ..... Pumped 25 bbls. oil and S.W.; P.B. 2,932 ft.

OUACHITA COUNTY

T. P. Lester's No. 1 Poindexter Est., 210 ft. N, 500 ft. W, SE cor. SW NW Sec. 35-15-18 ..... Drlg. 2,740 ft.
L. L. McDonald's No. 1 J. A. Robertson, 300 ft. S and E, NW cor. NE NW Sec. 25-15-16 ..... W.O.S.R. 2,092 ft.

UNION COUNTY

E. R. Henderson's No. 2 J. H. Ogden, 330 ft. S and E, NW cor. SW SE Sec. 23-18-14 ..... W.O.S.R. 2,208 ft.
E. R. Henderson's No. 1 Vines, 330 ft. N and W, SE cor. SW SE Sec. 23-18-14 ..... P.B. to 2,161 ft.
Mrs. R. K. Jones et al's No. 1 J. Davis, 330 ft. N and W, SE cor. NW NW Sec. 23-18-14 ..... Set 10-in. 120 ft.
Marine Oil Co.'s No. 2 Simmons, 150 ft. W, 200 ft. N, SE cor. NE NW Sec. 10-18-13 ..... Set 10-in. 168 ft.; drlg. 2,010 ft.
Tubal Pet. Co.'s No. 1 Gaddy, 340 ft. N and E, SW cor. SE NW Sec. 14-17-14 ..... S.D.; W.O. 3,416 ft.

Mississippi

GREENE COUNTY

United Gas Public Service Co.'s No. 1 Davis, C NW Sec. 30-1n-5w ..... Drlg. 4,250 ft.

SIMPSON COUNTY

Beavy Corp.'s No. 1 R. J. Beavy, C SW Sec. 24-2n-4e.. S.D. for 6⅝-in. 2,325 ft.

WALTHALL COUNTY

Mutual O. & Gas Co.'s No. 1 Boyd, Sec. 24-3n-9e, SW cor. SW SE ..... Moving in rig.

WARREN COUNTY

Orbet Drlg. Co.'s No. 1 R. L. Parker, 300 ft. E CWL, Sec. 14-14-1e ..... S.D. for cag. 3,161 ft.

Louisiana-Arkansas Proven Areas

North Louisiana

CADDO—RODESSA

Company, well, farm name, section and block—	Remarks:
R. W. Norton's No. 1-B J. B. French, 660 ft. S and E, NW cor., Sec. 34-23-16	Setting short string csg. 6,717 ft.

CADDO—HOSSTON

Shore Line Oil Corp.'s No. 1 Skelly, 3,770 ft. N, 1,873 ft. W, SE cor. Sec. 13-21-16 ..... Set 10-in. 65 ft.; drlg 300 ft.

OUACHITA PARISH

Ark.-La. P. L. Co.'s No. 6 Rea & Green, 2,240 ft. S, 1,400 ft. W, NE cor. Sec. 10-18-4e ..... Set 10-in. 522 ft.; drlg. 1,355 ft.

RICHLAND PARISH

United Carbon Co.'s No. 1 Wolf, 1,980 ft. N, 660 ft. W, SE cor. Sec. 35-17-6e ..... Drlg. 2,285 ft.

SABINE PARISH—ZWOLLE

Baird Bros.' No. 1 Cooper, 330 ft. S and W, NE cor. SE Sec. 30-8-11 ..... W.O.S.R. 2,580 ft.
Dyer et al's No. 1 McCollister, 330 ft. S and E, NW cor. SW NE Sec. 24-7-12 ..... S.D. 1,100 ft.
M. J. Kissick's No. 1 Barr, 350 ft. S and W, NE cor. SW SE Sec. 6-4-11 ..... Set 10-in. 140 ft.
Magnolia Pet. Co.'s No. 2 Gindratt, 330 ft. N, 320 ft. E, SW cor. SE Sec. 30-8-11 ..... T.A. 2,485 ft.
Magnolia Pet. Co.'s No. 2 Peterson, 990 ft. S, 330 ft. E, NW cor. NE NE Sec. 10-7-11 ..... Tested dry; S.D.; W.O. 2,748 ft.
Monroe Prod. Co.'s No. 3 Sabine Lbr. Co., 330 ft. S, 280 ft. E, NW cor. SW NW Sec. 7-7-11 ..... Set 10-in. 60 ft.; set 6-in. 2,390 ft.
Geo. L. Pace's No. 4 P. Greer, 330 ft. S and W, NE cor. NW Sec. 32-8-11 ..... Comp. flowing 200 bbls., 2,500 ft.
J. H. Reeve's No. 3 Sabine Lbr. Co., 330 ft. S, 280 ft. E, NW cor. SW NW Sec. 7-7-11 ..... Set 6-in. 2,395 ft.
Ben F. Smith's No. 2 Williams, 360 ft. S, 480 ft. W, NE cor. SE Sec. 32-8-11 ..... Set 6-in. 2,220 ft.; drlg. 2,300 ft.
Tex-La-Ark Oil Co.'s No. 1 Pickering Lbr. Co., Sec. 3-3-12 ..... Drlg. 400 ft.
A. H. Tarver's No. 2 Bauer and Barthold, Sec. 25-8-12 ... S.D.; W.O. 2,639 ft.
John Wrather et al's No. 1 Pruitt, 110 ft. W, 330 ft. N, SE cor. SW NE Sec. 25-8-12 ..... W.O.S.R. 2,575 ft.

SABINE PARISH—PLEASANT HILL

Bridges Co., Inc.'s No. 1 Moore, CEL NW NW Sec. 5-9-12 ..... Drlg. 1,750 ft.

Mississippi

HINDS COUNTY

Alexander & Weaver's No. 1 Mayes, Sec. 25-6n-1e ..... Coring 2,350 ft.

RANKIN COUNTY

Benedum & Trees' No. 1 Southern Dev. Co., Sec. 35-3n-1e ..... Drlg. 3,600 ft.
Ferguson, Fuller & Mets' No. 1 Ammons, 350 ft. E and S, NW cor. NW NW Sec. 35-3n-3e ..... Partly rigged and S.D.
Hensley & Tanner's No. 1 Sloan, 450 ft. S and E, NW cor. NW SW Sec. 7-5n-3e ..... Rigged up.

East Texas (Border Counties)

CASS COUNTY

Broderick & Calvert's No. 1 Cagle, H. Cunningham Sur.. Dry and abd. 3,846 ft.

HARRISON COUNTY

R. C. Payne et al's No. 1 Lowery, E. D. Spain Sur. ..... Fishing for D.S. 3,190 ft.

PANOLA COUNTY

Acre & Rotunda's No. 1 Burnett Lbr. Co., J. H. Mallory Sur. ..... S.D. for high wtr. 660 ft.
Adams & Despot's No. 1 Adams, Thomas Cox Sur. ..... Comp. 250,000 ft. gas, 2,307 ft.
Givens & Holloway's No. 1 Wooten Est., Winnie Mann Sur. ..... Set 10-in. and S.D. 40 ft.
A. M. Keicker et al's No. 1 Frost Lbr. Ind., M. S. Potts Sur. ..... Csg. parted 1,960 ft.; T.D. 2,450 ft.
R. W. Price's No. 1 Crawford, J. A. Williams Sur. ..... Moving in rig.
Sebring et al's No. 1 Bozeman, Wm. English Sur. ..... S.D. for wtr. 1,700 ft.

SHELBY COUNTY

Bush Oil Int.'s No. 1 Windham, W. M. Blackburn Sur.. S.D.; high wtr. 3,366 ft.
Turner & Neil's No. 1 Pickering Lbr. Co., P. W. Harvey Sur. ..... Rigging up.

SUMMARY OF STATEMENTS RELATING TO BUSINESS OF VARIOUS PIPE LINES FOR MONTH ENDING FEBRUARY 28, 1934

	Gross stocks	Runs from wells	Other receipts	Regular deliveries	Other deliveries
Nat. Transit	344,175.68	205,751.41	636,993.01	425,306.56	435,926.59
S. W. Pa. P. L.	423,472.79	59,190.33	699,399.45	469,070.43	293,340.08
Eureka P. L.	912,320.34	229,601.02	207,856.73	204,648.89	229,442.41
Buckeye P. L. (Macksburg)	311,574.10	198,915.31	112,037.41	165,969.90	86,420.57
Buckeye P. L. (Lima, etc.)	2,517,130.76	43,655.12	1,782,808.66	1,081,241.73	787,489.19
Buckeye P. L. (Cleveland)	37,163.19	6,952.70	159,699.71	974.81	164,976.25
Indiana P. L.	426,113.99	.....	932,405.92	832,564.65	113,501.40
Pure Oil Co.	786,465.15	628,885.60	5,467.01	615,042.61	.....
Southern P. L.	107,585.16	.....	43,524.36	5,467.01	38,666.25
Bradford Trans.	323,069.13	368,836.94	.....	371,335.74	.....
N. Y. Transit	100,621.96	27,192.48	128,157.80	146,828.75	.....
Northern P. L.	170,650.78	.....	311,394.66	43,309.33	293,704.90
Tide Water P. L.	773,671.89	22,311.02	362,720.42	369,347.70	.....
Tuscarora Dev.	5,571.53	.....	.....	167,133.97	.....
Valvoline P. L.	110,817.17	59,737.57	.....	38,277.33	35,202.26
Other companies	98,408.60	218,128.85	17,649.38	173,578.99	.....
Total February 28	7,448,842.22	2,069,158.35	5,400,115.02	5,110,098.40	2,478,699.90
Total January 31	7,615,558.77	2,455,595.42	5,901,884.22	5,717,929.44	3,109,891.10
Difference	166,716.55	386,437.07	501,769.20	607,831.04	631,221.20

CLASSIFIED ADVERTISING

Leases—Production

WOODBINE SAND Wildcats starting where you have chance might make 40 for 1. Leases-Royalties. E. Croft, Proctor, Tex.

BROKERS-SALESMAN
The scene of the next big oil boom—The Permian Basin in West Texas and New Mexico—Can supply you with drilling blocks, close in acreage to Major Oil Companies drilling blocks or choice non-producing royalties located on geophysical highs—I have my own field men covering this area. Inquiries invited.
B. D. BUCKLEY
Paul Brown Bldg., St. Louis, Mo.

OIL WELLS in the shallow sands produce about as much oil as deep wells under proration. We are now drilling. Get price on offset tracts. W. J. Dobbs, Wilson Bldg., Dallas, Texas.

NEW OIL—Crane Upton—Ranchowner's Warranty deed, $6, assume $3. Jefferson Smith, Nalle Bldg., Austin, Tex.

Leases—Production

NEW MEXICO Oil and Gas Leases and royalties. Send 50 cents in stamps for new State Oil Map of New Mexico. Roy G. Barton. Clovis, New Mexico.

BROKERS—Well located leases and perpetual royalties at wholesale prices, small and large tracts. Write A. C. Smith, P.O. Box 927, Houston, Texas.

BLOCKS with good geology — cheap drilling. Shallow, long life Western Kentucky field. Will sell outright or make drilling deals. Address Box 300, Owensboro, Ky.

TO LEASE 2,000 acres in Southern Alabama oil field. Thousand of acres already leased. J. W. Newman, Mobile, Ala.

ATTENTION Oil Operators. For Sale in fee. Or lease Secs. 12 and 13, Blk. A-47, Andrews County, Texas. What am I offered? J. M., 1611 Pierce St., Amarillo, Texas.

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Compute white space at line rate.

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4 lines ..	1.40	2.40	3.40	4.40
5 lines ..	1.75	3.00	4.25	5.50
6 lines ..	2.10	3.60	5.10	6.60
7 lines ..	2.45	4.20	5.95	7.70
8 lines ..	2.80	4.80	6.80	8.80
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THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

For Sale—Equipment

25 K.W. and 40 K.W. Gas Engines, 220 volts, D.C. Two 100 K.W. Gas Engine Generator Sets, 220 volts, D.C. 7x6 Ingersoll-Rand ER-1 Air Compressor. Six-inch Oster Pipe Threading Machine. Also, large stock of lathes, pipe machines, milling machines, etc. Send for our list.
Terms to suit.
CINCINNATI MACHINERY & SUPPLY CO.
26 West 2nd St. Cincinnati, Ohio.

2—Worthington Feather Valve Compressors 18"x16" Nos. L-31514 and L-31515 belted to 2—100 H.P. Wagner motors 3 phase 60 cycle 440 volt 860 R.P.M.
2—Worthington feather valve compressors 11"x12" Nos. L-31401 and L-31403 belted to 2—60 H.P. Wagner motors 3 phase 60 cycle 440 volts 860 R.P.M.
W. C. Berry, Mayo Hotel, Tulsa, Okla. or Sonken-Galamba Corp., 64 N. 2nd, Kansas City, Kansas.

FOR SALE
RE-BUILT BOILER FEED AND LINE PUMPS—10x3½x10 and 10x4½x 10, 500 and 600 pound fluid end tested Worthington Duplexes, and 10x3x10 and 10x4½x10, 500 and 1,500 pound fluid end tested Gardner-Denver Duplexes. Completely overhauled and guaranteed first class. Suitable for handling oil, water or any non-corrosive fluid. Exceptionally attractive prices. Write for specifications, capacities and prices.
THE BRIDGEPORT MACHINE CO., WICHITA, KANSAS.

RARE opportunity, a practically new Weber 50 H.P. Diesel engine at a ridiculously low figure. Hobson-McFarland Tractor Co., 2131 Washington St., Kansas City, Mo.

ONE 135 Horse Anderson Diesel Engine. The Topeka Foundry & Iron Works Company, Topeka, Kansas.

600 H.P. OIL ENGINES
2—600 H.P. McIntosh and Seymour Diesel Engines 6 cylinder, Nos. 1836 and 1837. Operated less than 8,000 hours each, guaranteed perfect condition, located at Casper, Wyoming, direct connected with clutch to 2—Worthington Oil Pumps horizontal triplex high pressure capacity 40,000 Bbls. each with all auxiliaries. Will sell all or any part.
W. C. Berry, Mayo Hotel, Tulsa, or Sonken-Galamba Corp., 64 N. 2nd., Kansas City, Kansas.

Oil Industry Printing

OIL FIELD LEGAL BLANKS
Leases, assignments, releases, township plat books, well records, etc. Request on your letterhead gets free catalog. Olds Press, 215 East Third St., Tulsa, Okla.

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REFINERIES—CRACKING PLANTS—
GASOLINE PLANTS
Design, consultation and construction
of
Refineries—Skimming and Cracking.
Natural Gasoline Plants.
Air and Gas Lift Plants.
Financing for Good Propositions.
S & S ENGINEERING CO.
532 Beacon Life Bldg.
Phone 5-3416 Tulsa, Okla.

Chemists

GINTER CHEMICAL LABORATORY
Analytical Work on Oil, Gas, Water and Cores
118 West Cameron
Tulsa

Equipment Wanted

WANTED—One steam driven direct connected two stage compressor to process approximately one million cubic feet gas daily at two hundred pounds. Preferably Ingersoll-Rand Type 10 Imperial. Must be in first class condition. Address F. M. Neely, Schneider Hotel, Pampa, Texas.

USED EQUIPMENT is bringing better prices now than in years, as there is so little available to meet the rising demand. If you have used equipment in good condition, now is the time to let buyers know of it. A small advertisement in these columns will cost very little and is most certain to reach prospective buyers.

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GOLD — SILVER
PROPERTIES
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GAS AND OIL MEN HERE IS YOUR OPPORTUNITY TO START A LIQUID GAS COMPANY with capital of $5,000, or more. This business will show results from first 3 months' operation, in a territory where gas mains are not available. Just completed 5 butane and propane plants and sold out at a profit. Or would consider managing gas company where results are essential and earnings and public relations need building; special ability in reducing overhead. Address Box G-120, The Oil and Gas Journal, Tulsa, Okla.

Situations Wanted

YOUNG graduate engineer, seven years experience design, construction, operation gasoline plants. Address Box G-131, The Oil and Gas Journal, Tulsa, Okla.

Help Wanted

WANTED—Man to sell oil furnace return bends, headers and associated accessories. Must be energetic and willing to be constantly on the go. Write giving age, experience, salary expected, education and acquaintance with refineries. Interviews will be granted to all acceptable applicants. Address Box G-130, The Oil and Gas Journal, Tulsa, Okla.

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REGISTERED PATENT ATTORNEYS
United States and Canada
Before disclosing your invention to anyone, send for blank form:
"Evidence of Conception,"
Instructions "How to Establish Your Rights" and complete information FREE!
LANCASTER, ALLWINE & ROMMEL
418 Bowen Building,
Washington, D. C.

Royalties—Production

ANDREW J. BARRETT
The Philtower
Tulsa, Oklahoma

DEEDED ROYALTIES
WHOLESALE ONLY
Specializing in Groups and Combinations for fullest protection of principal and reasonable returns.
Individual Offerings for High Present returns — Undeveloped properties providing highly speculative possibilities.
Dealers Accounts exclusively.
J. B. McANALLY
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TULSA

PRODUCING OIL ROYALTIES
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Mid-Continent Area
LON L. SIMPSON
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Producing, semiproven and undeveloped royalties. Inquiries and offerings invited.
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Oklahoma and Kansas Producing Royalties supplied reliable dealers.
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Income Producing Royalties
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Harry A. George
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PRODUCING OIL ROYALTIES
in Fractional deeds from $100 up.
John L. Dickson, Box 1113, Tulsa, Okla.

PRODUCING OIL ROYALTIES
IN TEXAS
W. J. Dobbs, Wilson Bldg., Dallas, Tex.

WANTED PRODUCING ROYALTIES. Send description, runs, income, price, plat details. Box 363, Norman, Okla.

Oil and Gas Royalties
Kansas-Oklahoma-Texas
L. H. Witwer
217 Cole Bldg., Tulsa, Oklahoma

OIL REPORT SERVICE
A monthly service of Oklahoma Prorated Pools, giving Potentials, Pipe Line Runs and Allowables. Price $7.50. Clyde Kelly, 306 Petroleum Bldg., Okla. City, Ok.

WE OFFER ONLY—CHOICE ROYALTIES that we purchase outright. Deliveries are assured.
ROYALTIES INVESTMENTS CORPORATION
Suite 641 Kennedy Bldg., Tulsa, Okla.

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MONTHLY

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THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

Royalties—Production

MONTHLY PAYING ROYALTIES
Also Royalties Under and Offsetting Drilling Wells
INCOME ROYALTIES, INC.
W. E. Cook
309-10-11 Court Arcade, Tulsa, Okla.

PRODUCING OIL ROYALTIES
Bought and Sold.
Inquiries invited from Oil Companies, Bankers, Dealers.
DAVID R. MITCHELL & CO.,
Established 1916.
20 BROAD ST. NEW YORK

SELECTING OIL ROYALTIES
for dealers a specialty.
Kansas-Oklahoma City-Seminole
CHESTER IMES
First National Bank Building,
Oklahoma City, Okla.

A NEW YORK organization with experience and efficient facilities for wholesale royalty distribution in Northeastern U. S. and Canada would consider permanent exclusive representation, on basis of volume business and limited brokerage, of producer who can supply sufficient offerings, either exclusive or competitively attractive in price and quality. Address Box G-133, The Oil and Gas Journal, Tulsa, Okla.

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JAMES E. MILLER CO., 207½ E. Third St., Tulsa, Okla., will co-operate with responsible parties seeking aid in financing projects of higher order.

CAPITAL available for sound oil or mining projects; also for other new or going enterprises with future possibilities. Schelsel, 1150 Griswold St., Detroit, Mich.

LOANS on oil production available to owners of Royalty or Working Interests on settled Production. Loans may extend over a period of twelve months repaid monthly from runs. Forward full detailed information to Box G-132, The Oil and Gas Journal, Tulsa, Okla.

JOHN MORRIS, Seventh Floor, 1237 Market Street, Philadelphia, will help float small deal. No stock selling. Send full facts in first letter.

Incorporations

CHARTERS—Delaware best, quickest, cheapest, most liberal. Free forms. Colonial Charter Co., Wilmington, Del.

DELAWARE CHARTERS—Fees small, free forms. CHAS. G. GUYER, 901 Market St., Wilmington, Del.

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FIELD STORAGE and REFINERY EQUIPMENT

The engineering department of GRAVER offers you expert service in modern economies of design and erection. We are equipped to build and erect field storage, refinery, bulk plant, service station and truck tank equipment of steel plate construction with necessary fittings, either to your specifications or designed to your needs. GRAVER manufacturing and fabricating facilities are unexcelled, yet production costs are low. GRAVER experience and responsibility are long standing. GRAVER field erection is recognized for its good workmanship. Let GRAVER figure on your work.

GRAVER TANK & MFG. CORP.

General Sales Office: 332 South Michigan Avenue, Chicago.
General Offices and Factory: East Chicago, Indiana. *Rep. in Principal Cities.*

Nearly 75 Years in Steel Plate Fabrication

A NEW HELPER in the OIL FIELD

This hoist is a rachet type, using special Diamond roller chain and built with swivel hooks. The lever can be changed from one side to the other making it possible to use the hoist either end up, laying down, or in any position, for lifting or pulling.

The Oil Producers have found the Coffing Hoist to be a superior tool for their work on account of its light weight and compactness, and it is easy to operate.

They use them for picking up rod lines to oil wells, skidding engines, boilers and any cumbersome equipment into place, loading trucks, erecting rigs, or wherever a lift or pull is needed.

Capacities from ¼-ton to 6-ton; weights from 14 lbs. to 65 lbs.

These hoists can be obtained from our representatives:

The Drillers Supply Co., Wichita, Kansas—Norvell-Wilder Supply Co., Beaumont, Texas—Standard Supply & Hardware Co., New Orleans, La.—Young & Vann Supply Co., Birmingham, Ala.—Pacific Wire Rope Co., Los Angeles, Calif.—Pittsburgh Gage & Supply Co., Pittsburgh, Pa.—Trimble & Lutz Supply Co., Wheeling, W. Va.—The Bittenbender Co., Scranton, Pa.—Iverson Tool Co., Tulsa, Okla.

Manufactured by

COFFING HOIST COMPANY
DANVILLE, ILLINOIS.

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Panorama of the new refinery of the Raffineries de la Vacuum Oil Co., S.A.F. at Port Jerome, showing the power plant in the foreground

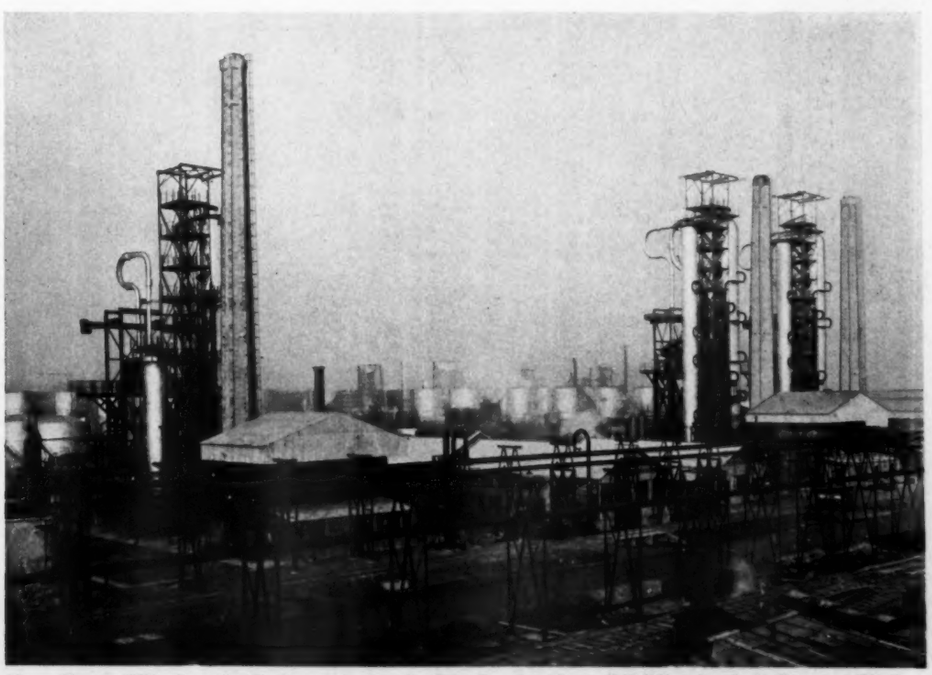
Refineries

The accompanying illustrations show a general view of the properties of Raffineries de la Vacuum Oil Co., S.A.F., at Port Jerome, France, and a closeup of the four distillation units erected on the refinery site. These four units will handle all of the distilling operations in this 6600 barrel per day refinery.

The power plant for the production of steam, electricity and compressed air for the refinery properties was built under the direct supervision of Foster Wheeler engineers.

Foster Wheeler distillation units have been erected in all of the major oil refinery centers of the world. It is thus natural that Foster Wheeler should assume a leading role in erecting major equipment for most of the important new refineries in France.

Foster Wheeler Corp., 165 Broadway, New York



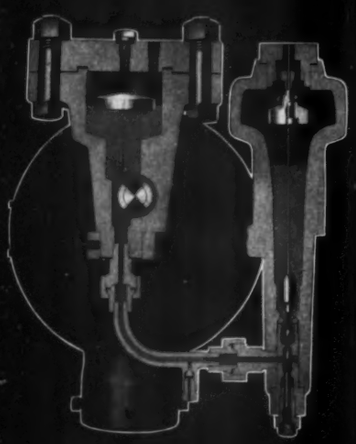
Four Foster Wheeler distillation units in the Port Jerome plant of Raffineries de la Vacuum Oil Co., S.A.F. The single stack at the left serves two rerun units, one for atmospheric operation and one for atmospheric or vacuum operation. At the right are two, two-stage atmospheric vacuum crude units

FOSTER WHEELER

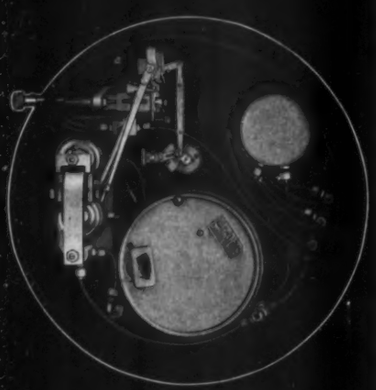
ANN ARBOR
University of Michigan
General
Ann Arbor
B-2155

TAG Magnetic Clutch Flow Controller

...A Universal Instrument



TAG Magnetic Clutch Flow Controller means SAFETY First, Last and ALWAYS . . . No Stuffing Box to leak or bind . . . 2500 pounds, Standard Construction . . . Forged Steel Manometer . . . Corrosion-Proof . . . Better Accuracy . . . Less Maintenance . . . Uniform Chart Divisions.



TAG Damplifier (Damped Amplification) Control for flow, temperature and pressure provides—Straight Line Control, no "hunting" . . . No Overswings coming into Control . . . Unaffected by Load Changes . . . 100% Automatic . . . Outside Setting Pointer Adjustment . . . Reversible Pilot.

COMPLETE
REFINERY
INSTRUMENTATION

C. J. TAGLIABUE MFG. CO.
Park and Nostrand Avenues
Brooklyn, N. Y.

FLOW TEMPERATURE PYROMETERS PRESSURE LEVEL